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April 1948

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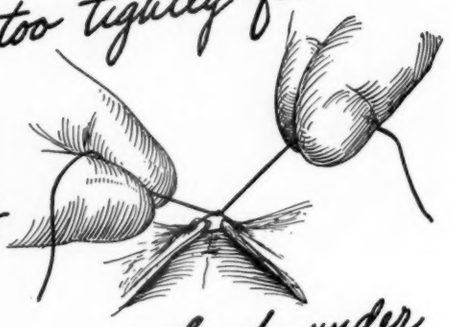

(2) Large suture
employed. Fine sutures break under
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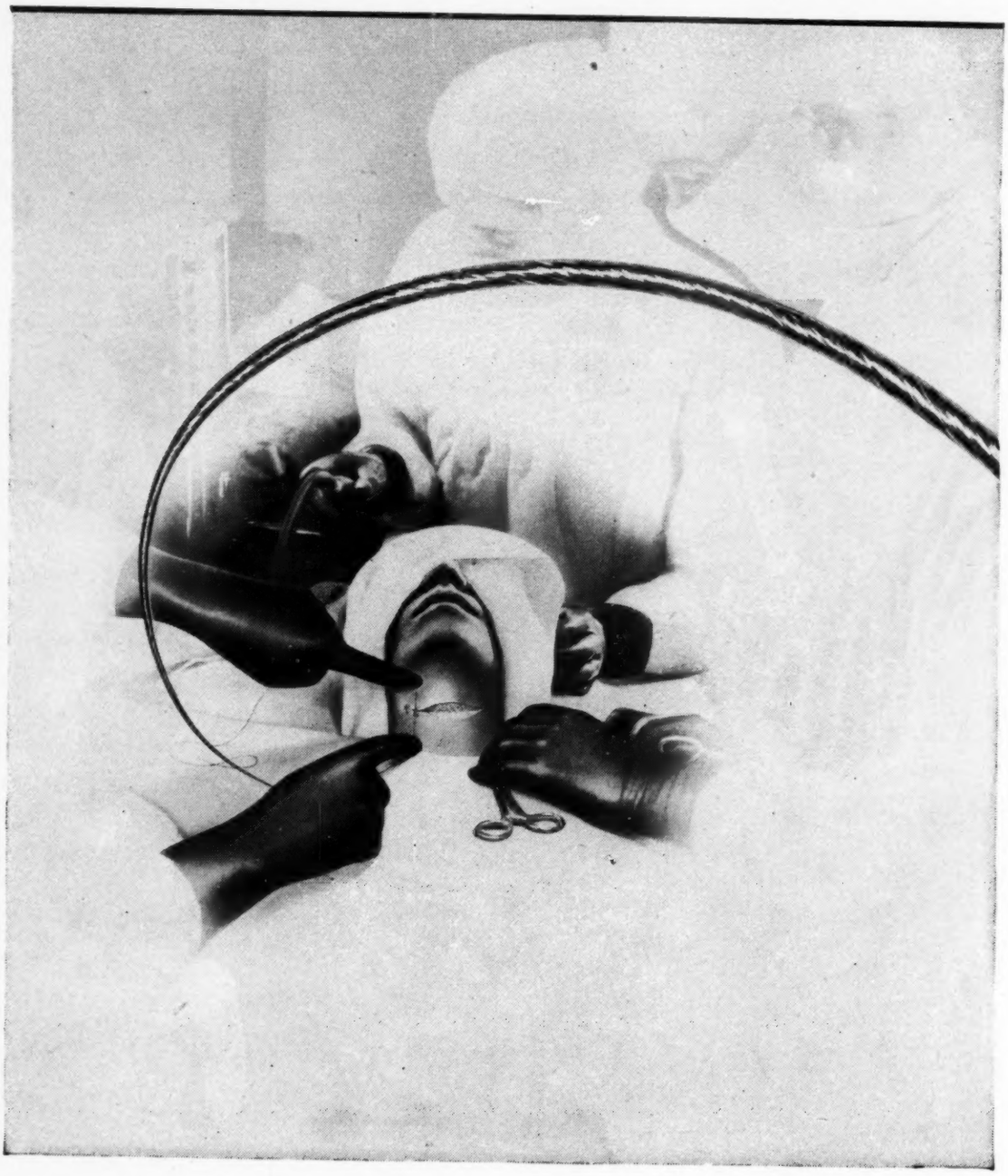

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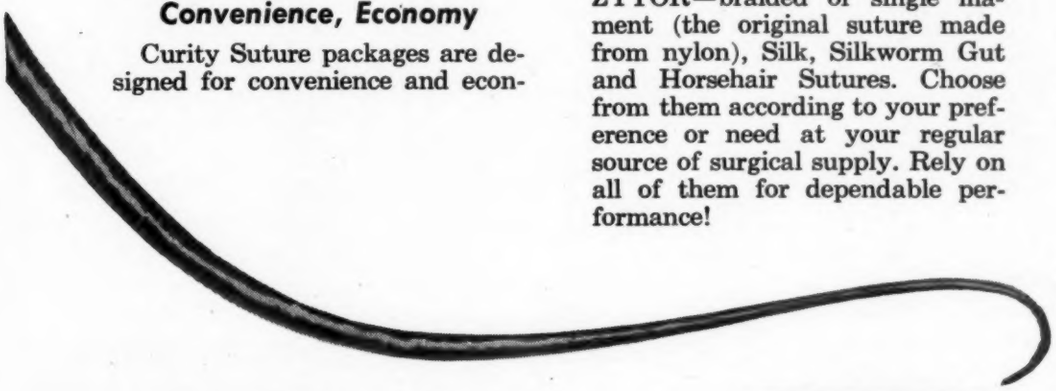

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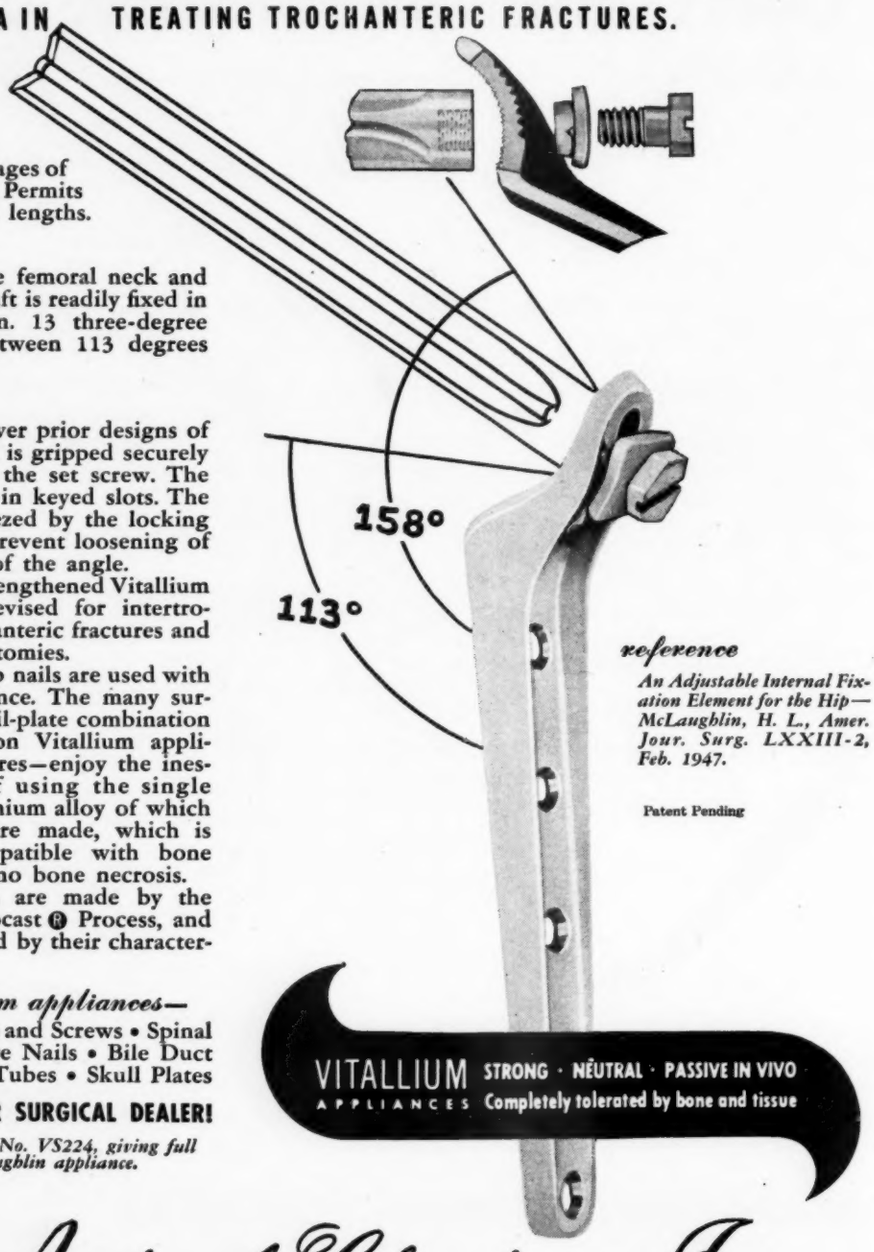

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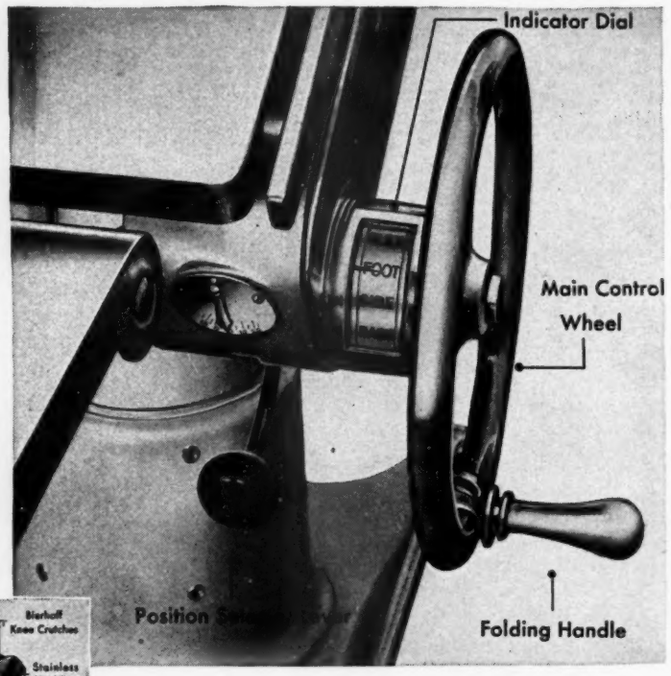

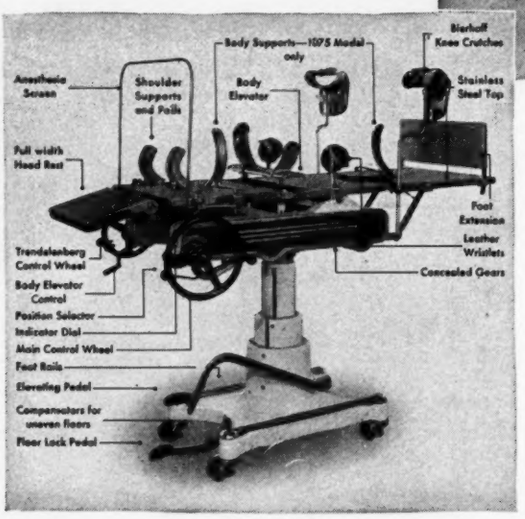

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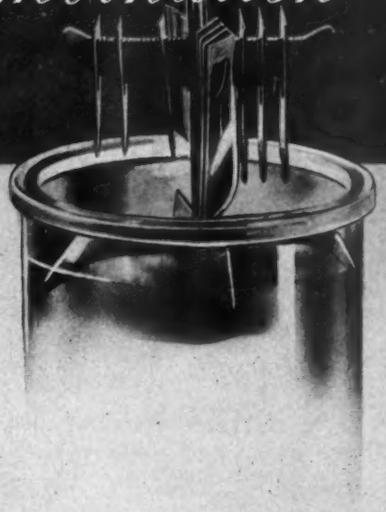

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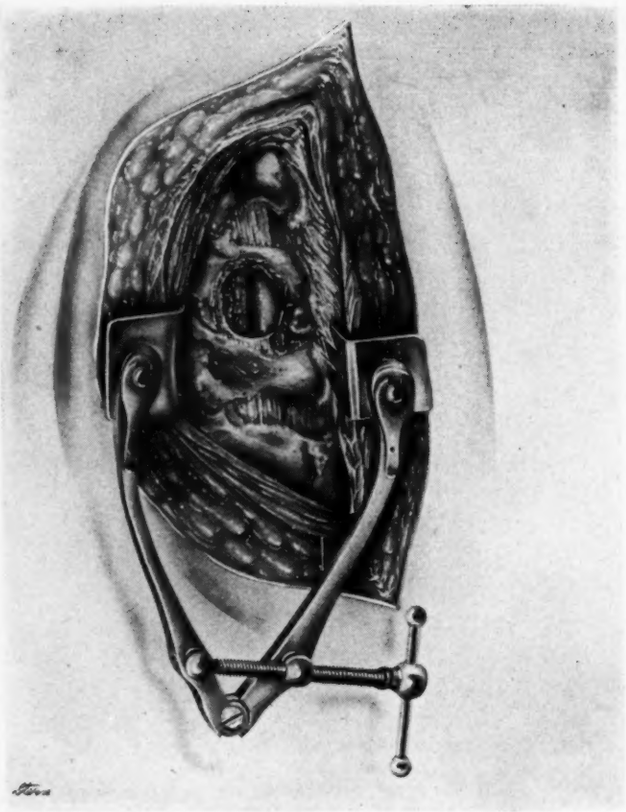

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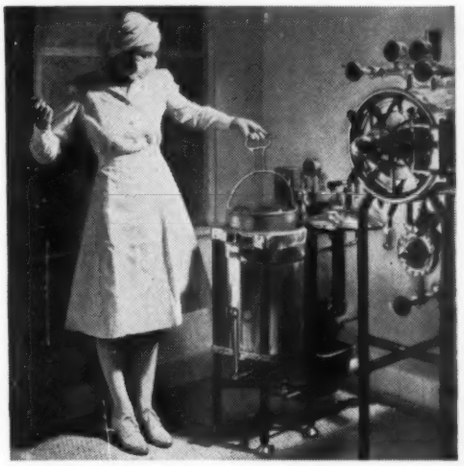

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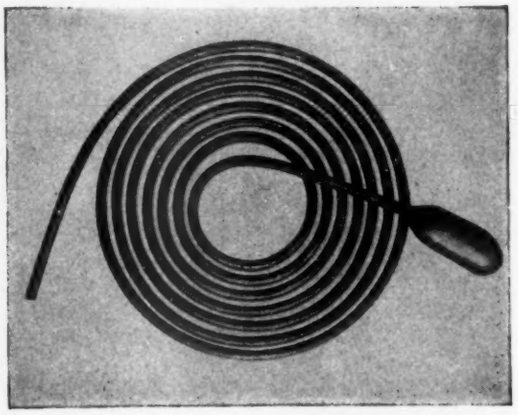

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OUTSIDE THE IVORY TOWER

Columbia University has been awarded a grant of $31,500 by the Rockefeller Foundation for the "investigation of the interaction of hereditary and environmental factors in relation to problems of aging," it was revealed by Dr. Willard C. Rappleye, dean of the Faculty of Medicine.

In the study, the health status and activities of New York State twins over sixty years of age, who reside in institutions for the aged, are being compared with those of twins outside of institutions.

There is still a need for twins of more than sixty years of age in New York City to participate in the study. Those interested are asked to communicate with the Department of Psychiatry, 722 West 168th Street, New York 32, N.Y.

The courtship and mating behavior of men and women has been "emancipated" from the complete dependence on hormone activity seen among lower members of the animal world, a Yale psychologist suggested today.

The male and female sex hormones, protracted research carried on for many years has shown, influence the mating behavior among all types of animals, including such acts as courtship and nest building. But in man the forebrain and particularly the cerebral cortex —the outer covering of the brain—have come to play an increasingly important rôle in controlling his courtship and mating responses.

This is among the significant findings disclosed by **Frank A. Beach,** Professor of Psychology at Yale University, in his book **"Hormones and Behavior,"** published by Paul B. Hoeber, Inc., medical book department of Harper and Brothers.

The medical profession as a whole has not devoted much scientific thought to discovering a cure for work. Some members simply hold to the theory that all men of sixty should be shot.

Dr. Joseph H. Peck believes that the average businessman or mechanic is pretty much shot anyway by the time he reaches sixty, but he thinks something constructive should be done about it. Retired after thirty years of medical practice in Toole County, Utah, Dr. Peck, now sixty-two, advanced his ideas on the subject in **"I Cured Myself of Working,"** in the January 17th issue of the Saturday Evening Post.

The income from the average annuity is not sufficient to let a man spend his declining years in steady, untroubled idleness, Dr. Peck contends. His income is $150 a month, so he, his wife and his sister, took up a farm near Auburn, Calif., in the foothill region of the Sierra Nevadas.

"I started with no knowledge whatever," he writes. "I have never been of a mechanical turn of mind or paid any attention to the usual household emergencies . . . I bought a couple of books on gentleman farming . . . (but) have never got around to reading them . . . I moved to a strange community and pledged myself not to enter a physician's office nor talk shop for at least one year."

The break with medicine was complete and his venture with cows and chickens and vegetables was successful.

About 30,000 pharmacies throughout the country, taking part in the **Veterans Administration home-town pharmacy program,** filled more than three-quarters of a million prescriptions for veterans during 1947, E. P. Geiger, acting chief of the VA pharmacy division, estimated.

Also, during the past year, some 200 pharmacies in VA hospitals, homes and regional offices prepared an estimated 4,000,000 prescriptions for patients. In addition, they supplied large amounts of routine medications to surgical and medical services in the hospitals.

Paul J. Kopsch, Richmond Hill, Long Island, N. Y., a senior medical student at the Long Island College of Medicine, has been announced as the recipient of **The Schering Award for 1947.** Mr. Francis C. Brown, president of Schering, and Dr. Norman L. Heminway, chairman of the Schering Award Committee, presented the first prize of $500 to Mr. Kopsch for his paper on "The Clinical Use of Androgens in the Female."

Robert C. Foreman of Western Reserve Medical School, Cleveland, Ohio, was awarded the second prize of $300, and Dr. Bernard L.

(continued on page 20)

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COPPER 1 MG.
IRON 32 MG.
IN AN ACTIVE SOLUBLE FORM
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(*continued from page* 18)

Rosenberg, recently graduated from Georgetown University Medical School, Washington, D.C., won the $200 third prize. Forty-three contestants received "honorable mention" by the judges and each will receive as a special award a triple-head stethoscope in a leather case.

The Schering Award is given annually for the best manuscripts prepared on a designated phase of endocrinology. Medical students of the United States and Canada are eligible for the contest.

Dr. Harvey Cushing, one of the greatest surgeons of all time, nearly abandoned his career when only a second-year medical student because he blamed himself for the death of a patient to whom he was administering ether during an operation.

According to Richard F. Match, writing in the February issue of Argosy magazine, friends persuaded Cushing to stay in medical school. Today, thanks to technics developed by the great surgeon, 90 per cent of brain-tumor patients live (compared to 10 per cent at the time Cushing was interning), and scores of Cushing-developed methods have proved invaluable to the medical profession.

It was Cushing, for instance, who found an ingenious blood pressure recorder in an obscure Italian hospital and introduced it in the United States. Now, every layman is familiar with the inflatable armlet. It was Cushing who pioneered nerve-splicing and a new and relatively safe approach for pituitary operations. It was Cushing who invented surgical instruments: improved burrs and saws for penetrating the skull cleanly and a pneumatic head tourniquet to prevent hemorrhage from the scalp. It was Cushing who developed electrosurgery for brain operations.

Cushing's capacity to work was almost inexhaustible. Correspondence, operations, examination of new patients and hospital rounds filled a tremendously busy day. But on top of all this, he managed to write between 5,000 and 10,000 words a day—several times the output of most professional writers. His "Life of Sir William Osler" won a Pulitzer Prize.

Ralph I. Straus, director of R. H. Macy, Inc., has been elected president of the **National Multiple Sclerosis Society** (Society's headquarters, Academy of Medicine Building, New York).

Dr. Thomas M. Rivers, director of the Hospital of the Rockefeller Institute for Medical Research, New York, accepted the vice-chairmanship of the Society's medical advisory board. The board is headed by Dr. Tracy J. Putnam, former director of the Neurological Institute of the Medical Center of New York, and comprises neurologists and psychiatrists in medical institutions throughout the United States.

Declaring that multiple sclerosis is the most important neurological disease at the present time, Dr. Rivers stated that the Multiple Sclerosis Society has a very important function in that it proposes to search for the cause and prevention of the malady. "Sufferers from the disorder are often seriously crippled and cannot lead a normal life, thus leading to great distress and suffering in their families," said Dr. Rivers.

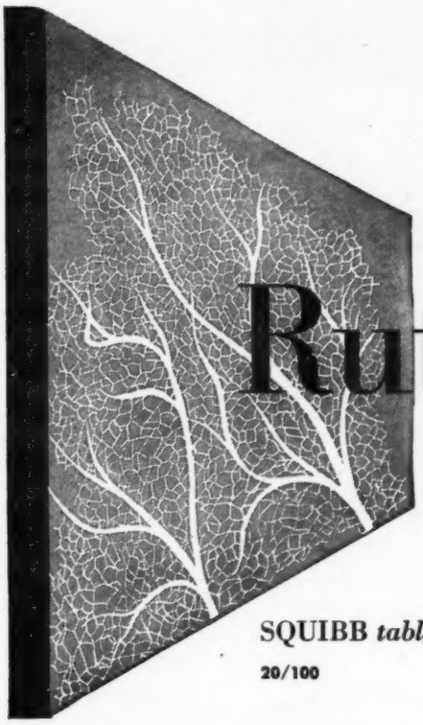
With special attention to the development of more healthful diets for inadequately fed population groups throughout the world, an investigation of nutrition as related to the degeneration of the liver will be carried out under a special **Squibb Fellowship in Therapeutic Research** granted to Dr. Bernardo Sepulveda of Mexico City, Mexico, it has been announced by Dr. James A. Shannon, director of the Squibb Institute for Medical Research. Dr. Sepulveda is a Chief of Service at the Hospital de Enfermedades de la Nutricion in Mexico City.

A committee has been organized to establish **a new foundation for basic medical research,** to improve public health. It is a committee of representatives from the pharmaceutical (including the medicinal chemical) industry and the medical profession.

The representatives from the pharmaceutical industry are Mr. S. DeWitt Clough, Chairman of the Board, Abbott Laboratories; Mr. A. H. Fiske, Vice President, Eli Lilly and Company; Mr. Elmer H. Bobst, President, William R. Warner & Co., Inc.; Mr. John L. Smith, President, Chas. Pfizer & Co., Inc.; Mr. S. Barksdale Penick, Jr., President, S. B. Penick & Co.; and Mr. Charles Wesley Dunn, of the New York Bar. The representatives from the medical

(*continued on page* 38)

when vascular walls weaken



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SQUIBB *tablets of rutin and ascorbic acid*

20/100 60/300

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Minimizes danger of vascular accidents

Rutorbin is useful for prophylaxis and therapy of hypertensive patients with increased capillary fragility, a group especially predisposed to retinal hemorrhage, apoplexy and death.[2] Restoration of capillary integrity with Rutorbin minimizes the danger of such vascular accidents. Rutorbin has no hypotensive effect. It is nontoxic, easy to take, and well adapted for prolonged maintenance therapy.

Rutorbin is indicated in other conditions accompanied by increased capillary fragility: diabetic retinitis, purpura, and drug idiosyncrasy (thiocyanates, arsenicals, etc.).

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1. Couch, J. F., et al.: Bur. of Agric. & Indus. Chem., U. S. Dept. of Agriculture. A1C-115 (April) 1946. 2. Griffith, J. Q., Jr., and Lindauer, M.A.: Am. Heart J. **28**:758 (Dec.) 1944.

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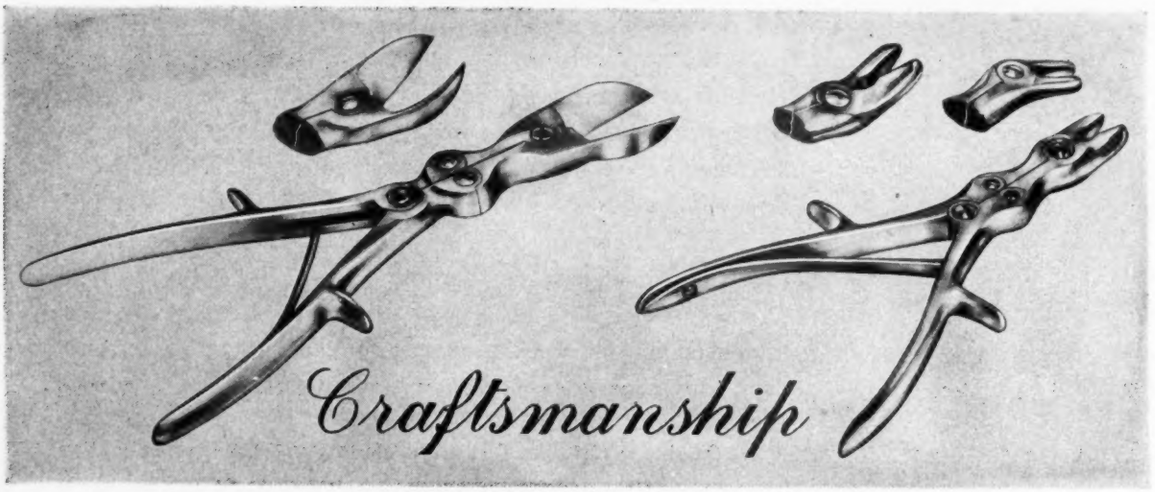

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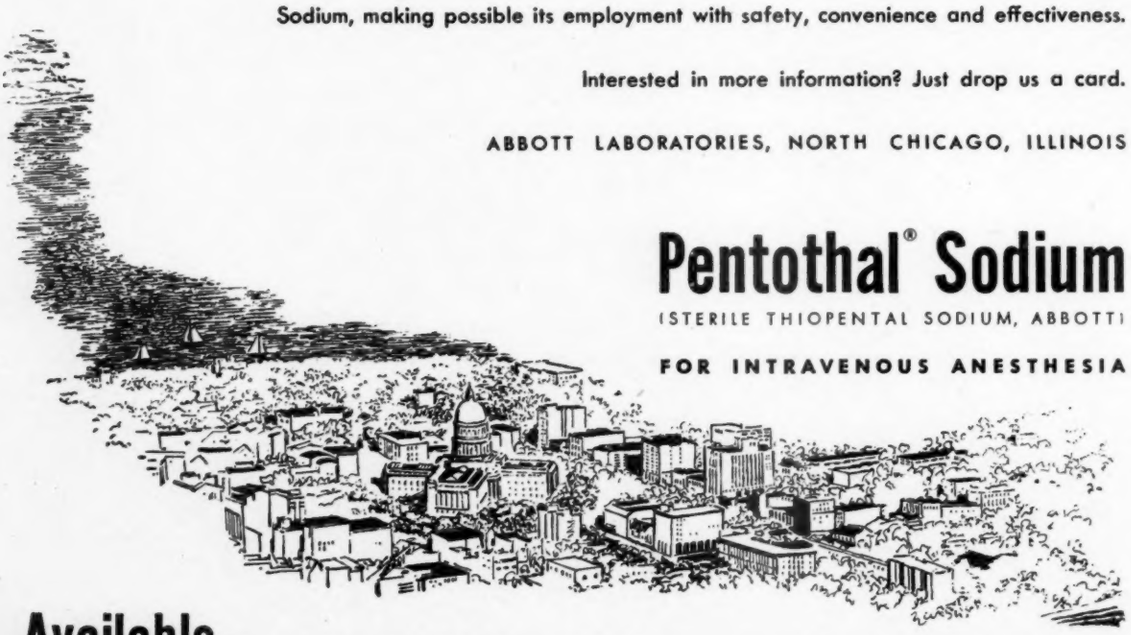
FOR INTRAVENOUS ANESTHESIA



Available—A new motion picture film on Pentothal Sodium in obstetrical procedures is available for medical groups interested in anesthesia. Write to the Medical Department, Abbott Laboratories, North Chicago, Illinois.

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Clinical reports continue to substantiate the *exceptional effectiveness* of 'Sulfasuxidine' *succinylsulfathiazole* as an enteric bacteriostat in intestinal surgery. After employing the drug, together with other appropriate measures, in the preoperative preparation of 50 patients for intestinal anastomosis, two distinguished clinicians concluded:

"Preparation with succinylsulfathiazole and aseptic anastomosis are factors in reducing the mortality rate."*

'Sulfasuxidine' *succinylsulfathiazole* is effective also in the treatment of acute or chronic bacillary dysentery, as well as the carrier state of the disease, and in ulcerative colitis. Supplied in 0.5-Gm. tablets in bottles of 100, 500 and 1,000 as well as in powder form in ¼-pound and 1-pound bottles. Sharp & Dohme, Phila. 1, Pa.

*Surg., Gynec. & Obst. 81:593, December, 1945

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2. *With sterile forceps, one end of Vaseline* Sterile Petrolatum Gauze Dressing is pulled out, while envelope is held with other hand. The emerging end of dressing is applied to wound (at the same time that pleated portion is withdrawn).*

3. *Application can be made with a motion similar to that used with a roller bandage. Dressing may be cut into strips or pads of preferred dimension, or folded into thickness desired, or used full length.*

Wherever a bland, non-adherent, non-irritant dressing may be required for burns or wounds—VASELINE* Petrolatum Gauze Dressings in *Individual Sterile Packages* are ever ready for instant use anywhere, any time! Each Baybank Dressing is a 3″ x 36″ strip of sterile, fine-meshed absorbent cotton gauze, uniformly saturated with sterile petrolatum, accordion-folded and heat-sealed in a moisture-proof, aluminum foil envelope. Baybank Dressings are handy for physicians' bags, first-aid kits, ambulances, emergency wards, operating rooms, etc., and may be used at the site of an accident in factory, home or street—as well as in the hospital or doctor's office. They can be used for a variety of indications by general practitioner, surgeon, industrial physician, et al.

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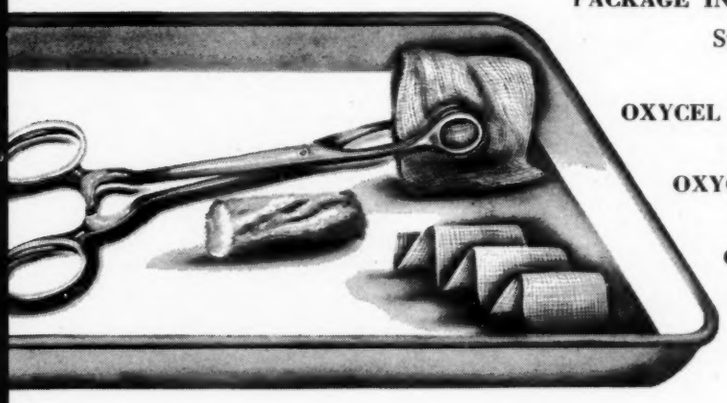

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To serve as a foundation for planning the morning meal, a basic breakfast pattern consisting of fruit, cereal, milk, bread and butter has been widely advocated. It provides a well-rounded assortment of essential nutrients, is universally available, is remarkably economical, and is readily acceptable to both children and adults.

The cereal serving, consisting of hot or ready-to-eat breakfast cereal, milk, and sugar, is the centerpiece of this meal. It supplies high quality protein, readily utilized caloric food energy, B-complex and other vitamins, and important minerals. In addition, it affords almost endless variety.

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The presence of this seal indicates that all nutritional statements in this advertisement have been found acceptable by the Council on Foods and Nutrition of the American Medical Association.

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Ready-to-eat or Hot Cereal, 1 oz.;	CALORIES..... 611	202
Whole Milk, 4 oz.;	PROTEIN..... 20.7 Gm.	7.1 Gm.
Sugar, 1 teaspoon;	CALCIUM.....0.465 Gm.	0.156 Gm.
Toast (enriched, white), 2 slices;	PHOSPHORUS .... 488 mg.	206 mg.
Butter, 5 Gm. (about 1 teaspoon);	IRON ..... 3 mg.	1.6 mg.
Whole Milk, 8 oz.	VITAMIN A ..... 1074 I.U.	193 I.U.
	THIAMINE..... 0.52 mg.	0.17 mg.
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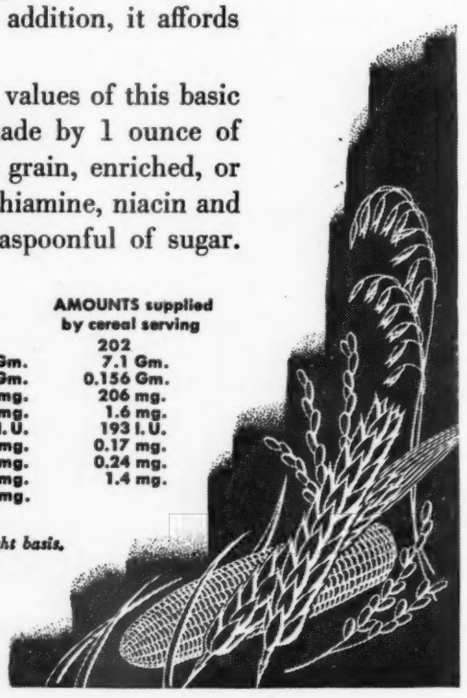
	NIACIN..... 2.3 mg.	1.4 mg.
	ASCORBIC ACID.. 64.8 mg.	

**Composite average of all breakfast cereals on dry weight basis.*



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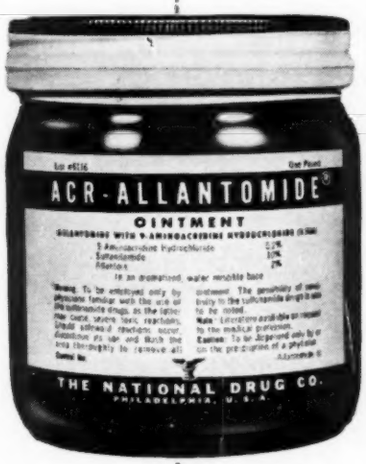
2. It is effective in the presence of pus.
3. It is non-injurious.
4. It does not sting.



Acr-Allantomide Ointment is intended for use in the local treatment of wounds, topical ulcers, burns and related surgical conditions. It is also of value in dressing boils, carbuncles and infected lesions.

[1] Martin, G. J. & Moss, J.: Proc. 111th Meeting A. S. C., p. 2B. Atlantic City, N. J. (April 14-18) 1947.

[2] Spotts, S. D.: Am. J. Surg. 2:183 (Aug.) 1947.

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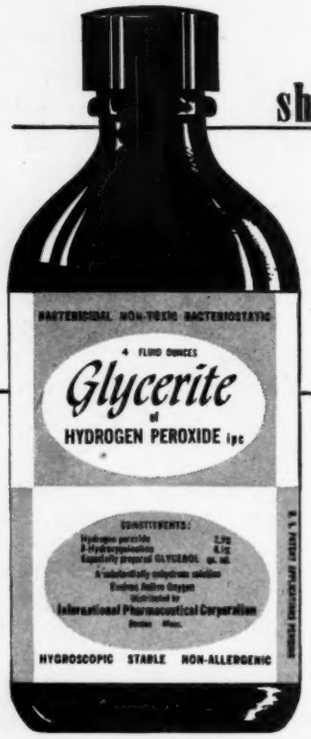

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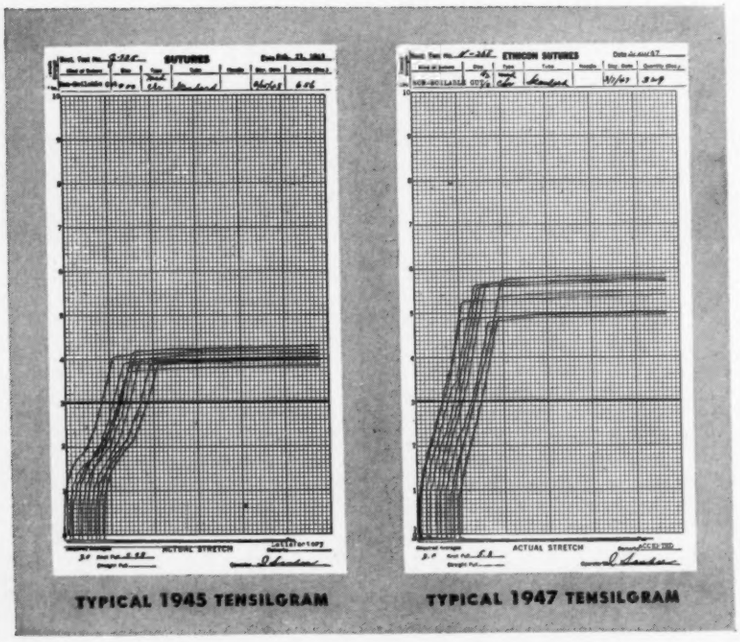

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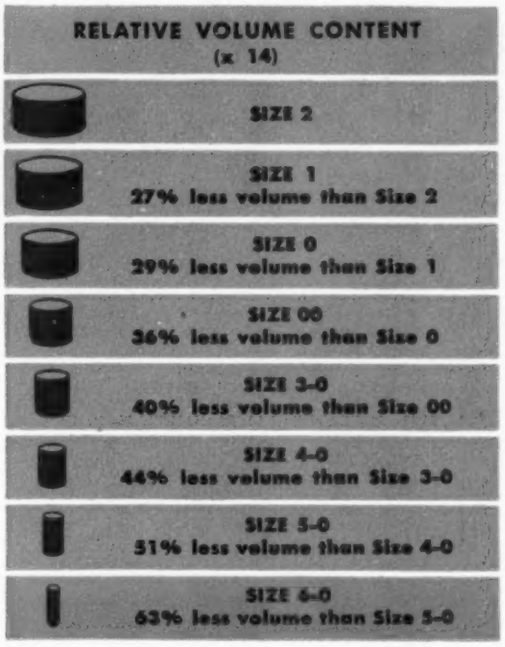

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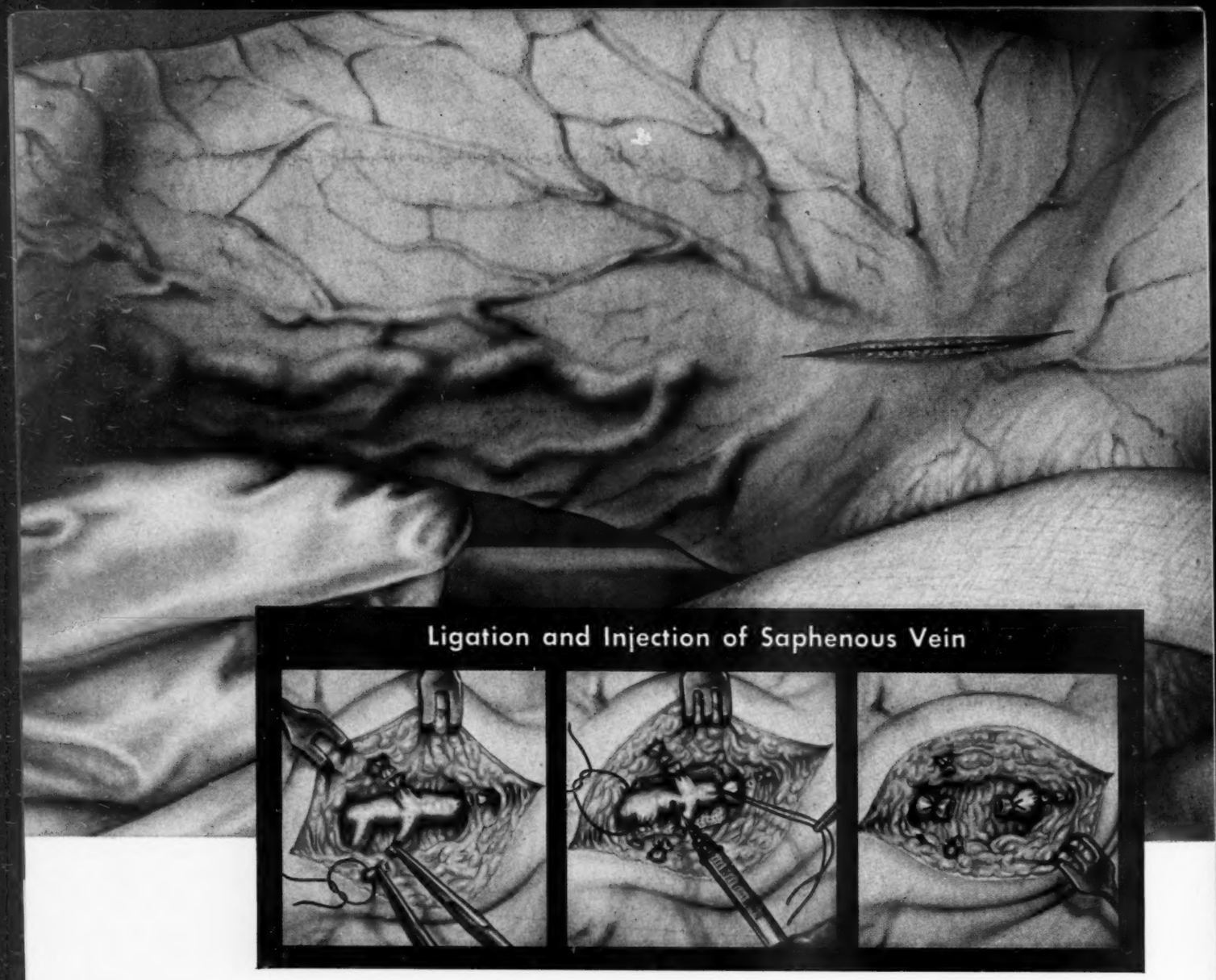

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Editorial

RECENT DEVELOPMENTS IN TREATMENT OF HYPERTHYROIDISM

DISCOVERY of thiouracil and, more recently, of propylthiouracil has reawakened interest in the possible non-surgical care of hyperthyroidism.

It became apparent at an early stage that thiouracil was not only a dangerous drug but that in the great majority of instances it failed to effect a permanent cure in this disease. Here and there an occasional successful result was reported, usually in an incipient case or in a persistent or recurrent mild case of exophthalmic goiter. The high incidence of complications and, in particular, of the often fatal agranulocytosis induced by its use soon caused most physicians interested in thyroid disease to largely abandon its use and rely upon the traditional method of thyroidectomy. There remain certain definite indications for its use despite its hazards. Until this drug was discovered no effective method of preparing the majority of patients with toxic adenomas for operation existed, iodine being only slightly beneficial in one-third of these subjects. Thiouracil so improved many of these bad risk patients that surgery could be performed with comparative little risk. Otherwise, thiouracil was not indicated in the treatment of hyperthyroidism with two possible exceptions, namely, to give a rest to iodine-fast patients with exophthalmic goiter and to tide over term the rare case of this disease occurring in late pregnancy. Even here some question exists as to the possible harmful effect of the drug upon the fetus. The concensus of opinion of most workers in the thyroid field was that patients should not be subjected to weeks and months of treatment with a dangerous drug when their health could quickly be restored by the long-accepted method of thyroidectomy.

A new drug, propylthiouracil, was then made available for research study. Investigation in over 2,000 cases in the past two years has definitely shown the merits of this antithyroid drug in contrast to thiouracil. As a consequence of this clinical study the drug was made available to the medical profession in July, 1947 and is now in general use.

Only a few papers and reports have been published on the results of the investigation of this new drug. While it is far less toxic than its predecessor, Bartels has reported one case of agranulocytosis from its use. In a series of 150 patients in whom the drug has been used no such case has occurred in the experience of the writer although the white blood count did fall to 2,500 in one instance. A few cases of skin reaction, vertigo, nausea and vomiting have been reported but, on the whole, far

fewer reactions have occurred than with thiouracil.

What of its effectiveness? Briefly it may be said that, like thiouracil, it will control but not cure hyperthyroidism. In a series of thirty-five cases recently studied, in which the patients had received the drug for periods of six to twelve months, in every instance but one, hyperthyroidism recurred within two months. There may be an occasional case, either mild or incipient, of exophthalmic goiter in which this drug will effect a cure, but a much longer period of study will be required to prove this.

What are the indications for its use? Since it is far less toxic and a great deal safer, it should entirely replace the more dangerous thiouracil. Undoubtedly, it was a mistake to have released the latter drug before a longer period of investigation had been undertaken. The large number of deaths reported and unreported that have resulted from the use of thiouracil has probably outweighed the good it has accomplished in the preoperative treatment of advanced cases of toxic adenoma.

It is in this latter group of cases that propylthiouracil has proved its greatest value. In these patients who so often fail to respond to Lugol's solution, digitalis or any other method of therapy, metabolism may be returned to normal and fibrillation and decompensation controlled. After weeks or months of this preparation the patient is conditioned for thyroidectomy which may be performed by an experienced thyroid surgeon, with little more risk than in the non-toxic group. It should be remembered, however, that iodine should be given for at least three weeks before operation and that it is desirable to stop propylthiouracil a week before this time. Otherwise, the greatly increased vascularity of the gland will cause considerable technical difficulty with the thyroidectomy and will necessitate the use of thrombin, gelfoam, koagamin and other coagulation substances.

There seems little indication for using this drug in the average patient with exophthalmic goiter who might be better prepared in the traditional way with Lugol's solution for ten days before operation. In the exceptionally bad risk patient, in the aged, in children, in the iodine-fast or in the pregnant patient it may be advisable to try the drug as a means of controlling the disease for the present time. Further study may show that longer periods of treatment, years rather than months, may effect a cure in some of these cases. However, there is no proof as yet that such prolonged periods of treatment may not result in permanent damage to certain organs such as the liver, spleen or bone marrow.

One of the problems introduced by this drug, as is the case with Lugol's solution, is that of increased difficulty in diagnosing a possible case of hyperthyroidism. When a young patient with a borderline case of hyperthyroidism has been given iodine for three weeks, the absence of all signs and symptoms of exophthalmic goiter may fairly well mask the picture and confuse the most experienced diagnostician. Propylthiouracil does the same thing when it is used over a long period of time; it is often prescribed by physicians not familiar with the disease and it may be expected to considerably confuse the problem of diagnosis. Undoubtedly the majority of physicians realize the importance of first making a careful examination and of obtaining an accurate history and a metabolism test before administering any drug to a patient with suspected hyperthyroidism. The problem then becomes simpler from the diagnostic aspect.

Most surgeons interested in the thyroid field now agree that an adenomatous goiter should be removed when it is ascertained to be present unless there are special contraindications to surgery. Adenomatous goiters, like gallstones, should be removed while they are still potential sources of fatal or serious complications. When hypertension, permanent myocardial damage or cancer has developed, it is not the time to perform thyroidectomy.

Thiouracil and propylthiouracil have

proved valuable aids in the treatment of hyperthyroidism. They will control but not cure hyperthyroidism. They have supplemented but not supplanted thyroidectomy.

No attempt has been made here to evaluate radioactive iodine because it is still in the clinical investigative stage. At the last meeting of the American Association for the Study of Goiter radioactive iodine was shown to destroy certain areas of cancerous goiters but to have no effect on other parts of the gland. In exophthalmic goiter, it may abate the hyperthyroidism, but as yet sufficient time has not elapsed to determine what will be the end results. Whether or not patients thus treated will develop myxedema in later years remains to be determined.

Arnold S. Jackson, M.D.

Original Articles

ADENOMA OF THE BRONCHUS*

REVIEW OF FIFTEEN CASES

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MEDICAL literature concerning bronchial adenoma appeared sparingly since Mueller's first description of this disease which he discovered at autopsy and reported in 1882. However, during the past decade an increasing number of reports have appeared. Today bronchial adenoma is widely recognized as a definite clinical and pathologic entity. This tumor, which accounts for approximately 80 per cent of the benign bronchogenic growths, is still a subject of much controversy and as yet no unanimity of opinion exists regarding its histologic origin, potential malignancy, relationship to cancer of the bronchus and its proper treatment.

It is the purpose of this paper to discuss the clinical manifestations, pathologic patterns, available methods of diagnosis and treatment, and to present an analysis of fifteen proven cases of bronchial adenoma studied by the authors, all of which were treated by surgical extirpation, ten by pneumonectomy and five by lobectomy.

GENERAL CONSIDERATIONS

Evidence has accumulated in considering these tumors potentially invasive and malignant. In recent articles [1–5] it has been definitely shown that the so-called benign adenoma does metastasize locally and occasionally to distant organs. Not infrequently surgical specimens demonstrate invasion of adjacent tissue, infiltration of the bronchial wall and metastasis to tracheobronchial lymph nodes.

If one follows the criteria set forth by Graham and Womach[6] for carcinoma which are: invasion of the adjacent tissue, involvement of regional lymph glands and metastasis to distant organs, it can be concluded that in a few cases this entity, although benign, is an incontrovertible evidence that at least some of these tumors have fulfilled all of the requirements of malignancy. However, many still regard with skepticism the possibility of a malignant transformation of these growths. Jackson and Konzelman[7] state that they do not believe that adenoma has an inherent tendency to metastasize or in any other way become malignant. Although the course of the disease points toward benignity, we believe that it can be accepted as an entity which has definite malignant characteristics. This is borne out by the fact that bronchial adenoma not infrequently shows local invasion, involvement of the bronchial wall and occasionally metastasis to the regional lymph nodes. Aside from potential malignancy the tumor eventually produces sequelae incident to bronchial obstruction, namely, obstructive emphysema, total atelectasis, chronic pneumonitis, bronchiectasis, pulmonary abscess and empyema.

In our series of cases one was reported by the pathologist* in 1933 as cancer unclassified, but later was changed to infiltrating adenoma. This patient had a right pneu-

* Dr. Shields Warren, New England Deaconess Hospital, Boston, Mass.

* From the Thoracic Service of Dr. Richard H. Overholt, New England Deaconess Hospital, Boston, Mass.

monectomy. Another case was reported as carcinoma of low grade malignancy, suggesting relationship to bronchial adenoma, with metastasis to one regional lymph node. This patient was operated upon seven years ago by right pneumonectomy.

We believe that a comparative study between bronchial adenoma and carcinoma groups will clearly show that these conditions rather than belonging to two grades or stages of the same neoplasm should be considered as being different. The salient

TABLE I

SALIENT FEATURES OF BRONCHIAL ADENOMA AND BRONCHOGENIC CARCINOMA

	Bronchial Adenoma	Bronchogenic Carcinoma
Average age	37.4 years	53.2 years
Sex	Male to Female 1:1	Male to Female 3.8:1
Average duration of disease before surgery is instituted	5.9 years	11.3 months
Clinical picture	Hemorrhages, often profuse, with sudden onset and termination; intermittent episodes of pneumonitis with healthy intervals; bronchiectasis common	Hemorrhages usually blood streaked and continuous; progressive secondary pulmonary complaints without healthy intervals
X-ray findings	Tumor frequently not visible; only shadows incident to obstruction are seen	Tumor frequently is seen
Bronchoscopic picture	Often pedunculated, small, pink, or yellowish in color; carina always sharp and mediastinum free; biopsy frequently followed by bleeding	Usually irregular, fungating, ulcerogranulomatous, non-pedunculated, gray or grayish-yellow; carina frequently, blunted and mediastinum fixed; bleeding minimal
Metastases	Occasionally regional lymph nodes; rarely distant	Regional and distant metastases frequent
Amenability to surgical cure	Almost 100%	10%
Survival	Long duration	Short duration

Another patient who had a left pneumonectomy five years ago demonstrated infiltrating adenoma of bronchial origin (malignant). Two later patients were both operated upon four and three years ago, respectively, both showing infiltrating adenoma of the bronchus. Another patient, operated upon one year ago, demonstrated during operation infiltration of the bronchial wall and the presence of metastases to two lymph nodes. All of these patients are now enjoying good health.

Striking differences in age and sex groups between bronchial adenoma and carcinoma strongly suggest that they are fundamentally different. Alexander,[8] in a recent discussion of bronchial adenoma, stated that their pathologist, Weller, has for many years insisted that the so-called adenoma is a Grade 1 carcinoma.

differences between these two entities are shown in Table 1.

CLINICAL PICTURE

The slow-growing tumor which inevitably but gradually occludes the bronchus will present a definite clinical picture depending upon its location, size and vascularity.

In the early stages the disease is usually asymptomatic but not infrequently, however, a dry, irritating cough is present. Hemoptysis is a cardinal symptom, is often profuse and is as sudden in its termination as in its onset. In women the attacks may coincide with the menstrual periods. Later, as the tumor encroaches upon the lumen of the bronchus, symptoms of partial or total obstruction may appear. A localized wheeze may be noticed by the patient. Dyspnea is

another frequent symptom present at this stage. Usually there have been episodes of pneumonia characterized by cough, mucopurulent sputum, fever and chest pain. These attacks of pulmonary infections are usually severe and slow to resolve.

As the tumor progresses, filling the lumen of the bronchus, obstructive effects with irreparable damage to the lung develop, as in bronchial carcinoma, so that the clinical picture is then one of either atelectasis, bronchiectasis, lung abscess or empyema.

DIAGNOSTIC PROCEDURES

Although the clinical history in most instances is suggestive, a plain roentgenogram will present further evidence especially related to the secondary effects caused by obstruction. The tumor itself is demonstrated only occasionally because of the inflammatory changes overlying it. However, the use of body section roentgenography will permit visualization of the tumor itself as a sharply defined round mass.

Bronchography[9] also allows reasonable accuracy in the delineation of the typical cap-shaped defect in the bronchus. The bronchogram is also informative as to the degree of damage caused distal to the lesion.

Bronchoscopy is still the most decisive single diagnostic procedure available. These tumors almost invariably arise in the major bronchi and are easily accessible for biopsy and histoligic study. The bronchoscopic appearance is typical. Usually a mobile, polypoidal, soft and smooth, pinkish, rounded mass can be seen protruding into the bronchial lumen. These tumors are pedunculated and attached to the bronchus by either a narrow or broad base, occasionally being sessile. They are covered with bronchial mucosa and sometimes are traversed by vessels. Ulceration is rarely seen. The intramural type, with a broad induration, can be mistaken for carcinoma. Histologic verification of adenoma is not always possible because the biopsy specimen may not contain tumor cells but only overlying epithelium and stroma. In other instances biopsy is not advisable because of the possibility of severe and fatal hemorrhage. Occasionally the lack of differentiation of the cells leads to an erroneous diagnosis of carcinoma.

Exploratory thoracotomy we believe should never be delayed when previous methods have failed to substantiate the diagnosis of adenoma.

PATHOGENESIS

The discrepancies regarding the histologic origin of bronchial adenoma accounts largely for the diversity of nomenclature. Several theories of origin have been suggested.[4] Fried expressed the belief that they arise from bronchiomucous glands. Reisner and Wessler and Rabin expressed the opinion that they arise from the duct epithelium of bronchial mucous glands. Goldman and Stevens suggested that the epithelium of either the ducts or the glands may be the site of origin. Mallory states that this tumor resembles carcinoids of the intestinal tract. According to Womack and Graham, the resemblance of adenoma to fetal lung is so striking that it would be extremely difficult, if not impossible, to distinguish one from the other on the basis of microscopic section. They also designate this condition as mixed tumors of the lung because of their observation of similar characteristics seen in mixed tumors of salivary glands. According to them, these tumors contain both endodermal and mesodermal elements. They further state that other anomalies of various kinds are not infrequently associated. They have found during operation either absence or excessive lobulations and congenital cystic disease. Jackson and Konzelman[7] indicated that they were not convinced of an origin from the epithelium of the mucous glands but merely state that the bronchial adenoma shows a peculiar epithelial proliferation in an equally peculiar stroma.

Histologically, bronchial adenoma is

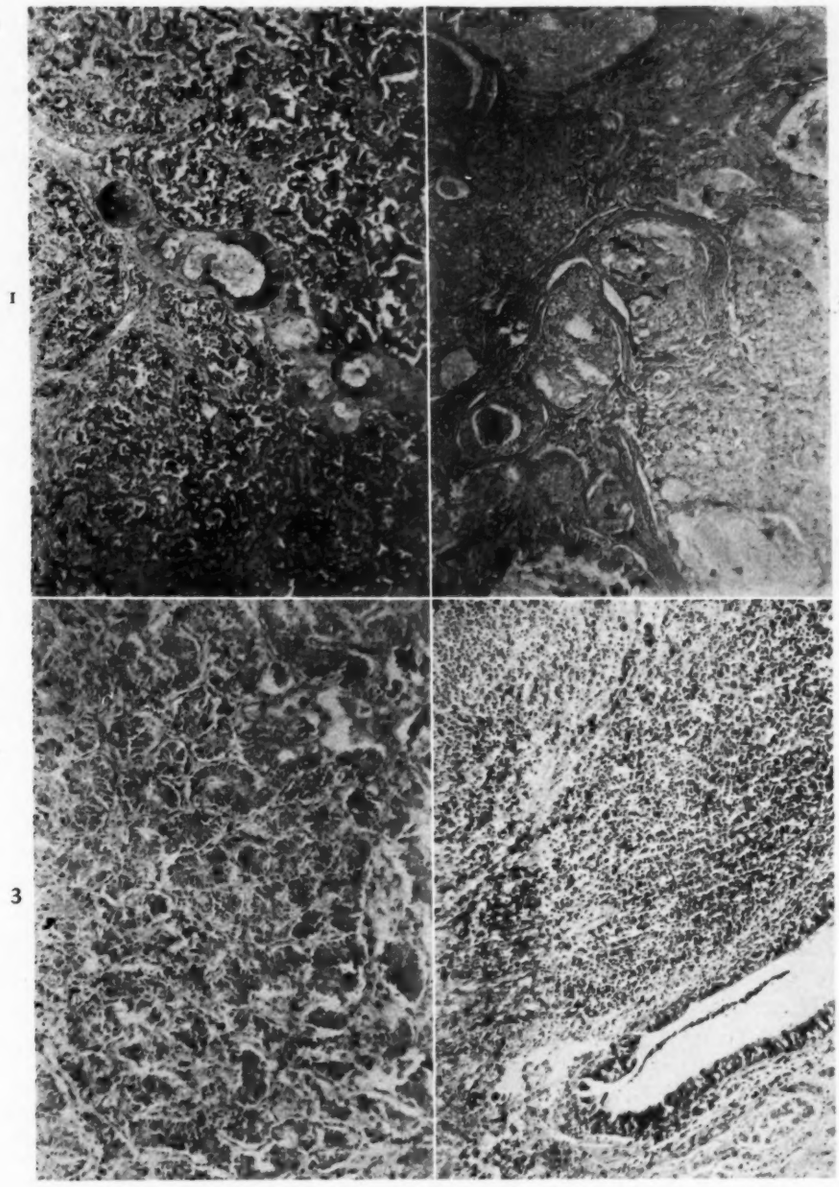


Fig. 1. Case x demonstrates bronchial adenoma showing infiltration between bronchial mucosal glands.

Fig. 2. Case xi demonstrates bronchial adenoma. Tumor cells relatively large with vesicular nuclei and clear cytoplasm; some attempt at acinus formation.

Fig. 3. Case vi demonstrates infiltrating adenoma. Note cord-like pattern of cell clusters; occasional small acinar lumen formed.

Fig. 4. Case ix demonstrates infiltrating adenoma which had metastases in two lung hilar lymph nodes. Here the tumor is projecting into the bronchial lumen. Type cell relatively small with hyperchromatic nucleus; nuclei often eccentrically placed, resembling plasma cell. There is some attempt of the cells at alignment into cords.

characterized by the rarity of mitotic figures, tendency for the cells to be grouped and uniformity of cell type. It is marked by variability of form. The cells are small, cuboidal, polygonal and contain a dark nucleus. They are grouped in a variety of patterns which may be alveolar, columnar, nodullary or mosaic in type depending upon the arrangement of the stroma which divides the cells into groups.

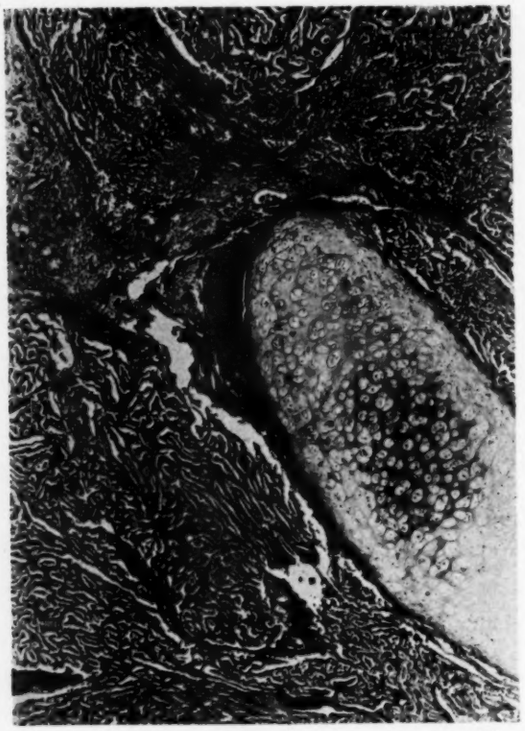


FIG. 5. Case VIII shows the more common histologic picture, suggesting a carcinoid type. Note infiltration around cartilage.

The variable histologic pictures of five representative cases in our series are shown in Figures 1 to 5.

TREATMENT

The methods of treatment of bronchial adenoma are three: (1) Radiation therapy; (2) bronchoscopic treatment including (a) implantation of radon seeds, (b) electrocoagulation and (c) forceps removal; (3) surgical extirpation consisting of (a) lobectomy and/or (b) pneumonectomy.

Radiation therapy as a form of treatment has little effect upon the tumor and is not without danger. Foster—Carter has found irradiation efficacious but reports a few deaths from hemorrhages after treatment, apparently as a result of necrosis of the bronchial wall and erosion of blood vessels.

Case V in our series was treated by radiation therapy, receiving 1,200 R units in thirty applications over a period of thirty days. Later a bronchoscopy still revealed the presence of the tumor. Treatments by bronchoscopic implantation of radon seed and electrocoagulation were immediately instituted. While it is true that no evidence of the tumor was found during the operation, it is interesting to note that the lung specimen revealed extensive fibrosis and bronchiectasis necessitating surgical extirpation. Obviously this was a radiation therapy failure. Bronchoscopic treatment of benign endobronchial tumors by implantation of radon seeds, electrocoagulation and forceps removal are methods practiced mainly by most bronchoscopists. We, however, firmly believe that these procedures carry with them numerous important disadvantages, namely, (1) Local recurrence after removal; (2) technical difficulties associated with removal because of size and broad implantation; (3) it is incomplete because of the intra- and extrabronchial extension of the tumor as shown in Case XII; (4) danger of fatal hemorrhage; (5) persistence of the irreversible suppurative changes distal to the growth (Case V) and (6) presence of regional metastases.

Implantation of radon seeds were used in Case V supplementing radiation therapy without success.

Electrocoagulation, according to Jackson, seems to be a safer procedure than the piecemeal forceps removal since it has the advantage of minimizing the chances of bleeding.

Bronchoscopic removal should be utilized only in patients who refuse surgery, or as a preoperative attempt to bring about drainage and temporary improvement in chronic pneumonitis.

Inasmuch as the use of bronchoscopic treatment for removal of bronchial adenoma is therefore limited and in view of the fact that bronchial adenoma has been proved to recur locally and to be potentially malignant, we believe that surgical removal either by lobectomy or pneumonectomy should be accepted as the primary treatment of choice. The extra-bronchial extension of the tumor and the added irreparable pulmonary damage makes surgery the only rational form of therapy.

We have reviewed all of the bronchial adenoma and carcinoma cases treated by Overholt since 1933. Three hundred five histologically verified cases of pulmonary carcinoma and fifteen of bronchial adenoma were included in this study. Bronchial adenoma constitutes 3.6 per cent of the patients considered. The average age for carcinoma was 53.2 years and for bronchial adenoma 37.4 years when surgery was instituted. It is uniformly accepted that the latter disease occurs more frequently in women and the former in men. In our series the ratio between male and female was, in the cancer group, 3.8 to 1 and in the adenoma group 1 to 1.

Although adenoma of the bronchus, as a group, compared to carcinoma appears small, it assumes a great importance when one considers that they nearly all are operable and curable. In the 305 cases of the pulmonary carcinoma group eighty-seven were thought to be suitable for resection. Of these, thirty-seven had a palliative pneumonectomy because of metastases. Of the carcinoma group, fifty had a curative resection compared to the twelve of the adenoma group. Therefore, among the curable bronchial neoplasms, adenoma comprises about one-fourth of the group.

CASE REPORTS

Case 1. T. A., a female aged fourty-six, was admitted to the hospital October 24, 1944. The patient was first taken ill in 1933, at which time she complained of cough, bloody sputum, chills and fever. X-ray showed a round, well circumscribed tumor mass about the size of a tangerine in the right lung near the hilus. Bronchoscopy revealed a smooth growth obstructing the lower lobe bronchus. The tumor was vascular and bled easily. Bronchoscopic biopsy was negative. She had a right pneumonectomy on November 13, 1937 with a suspected diagnosis of carcinoma. Gross specimen revealed a moderately firm, slightly resilient, definitely circumscribed, tumor mass, 4 cm. in diameter, at the hilus of the middle lobe. The tumor tissue filled one of the main bronchi and compressed the surrounding lung tissue. The bulk of the tumor distended the bronchus to the middle and lower lobes with greater involvement of the middle lobe. There was no evidence of invasion except at the posteromedial aspect of the tumor where it merged with the bronchial wall. It was readily shelled out from the surrounding lung tissue. Many enlarged lymph nodes were found to be negative.

Comment. This case demonstrates that it is not always possible to remove representative tissue for biopsy because of the capsule surrounding the tumor and the thickened mucous membrane overlying it. It also proves that the diagnosis of these tumors is often a histologic puzzle. This tumor was first diagnosed as carcinoma unclassified. However, a later review of the slide by Dr. Shields Warren was regarded as consistent with an infiltrating bronchial adenoma. At the present time, twelve years after operation, the patient is enjoying excellent health which proves that this type of tumor is benign.

Case 11. C. M., a female aged thirty-seven, was admitted to the hospital February 28, 1938. Eight years prior to admission she had two episodes of hemoptysis, raising over a cupful of fresh blood, following grippe. During the following two years she had frequent, dry, coughing spells. Two years later x-ray of the chest revealed a thickened pleura. Between 1932 and 1936 she had no hemorrhages. In 1936 she had a severe hemorrhage, following which she had hemoptyses coinciding with her menstrual periods. Occasional episodes of dyspnea occurred. Physical examination was non-contributory. X-ray revealed atelectasis and cystic disease of the left lung with displacement of the mediastinum to the left. Bronchoscopy revealed a protruding mass about the level of the left upper lobe bronchus. This mass was soft, pinkish in color, with a wide base and bled easily. Biopsy was reported as adenoma, benign, epithelial tumor of the bronchus. Left pneumonectomy was performed on March 11, 1938. The lung was atelectatic and a tumor mass was palpated in the upper lobe. The gross specimen removed showed a well circumscribed, coarsely nodular, elastic, pinkish-gray tumor mass firmly attached to the posterior bronchial wall at the level of the upper lobe orifice and measuring 5 by 3½ by 2 cm. Distally, bronchiectasis and

cystic formation were present. Histologic diagnosis was compatible with the so-called bronchial adenoma.

Comment. Although a bronchoscopic biopsy reported this case to be a benign bronchial adenoma, it was obviously not suitable for bronchoscopic removal because of the following: the danger of profuse hemorrhage, extra-pulmonary invasion and irreparable pulmonary damage. In spite of the duration of the disease no metastatic lymph nodes were found, indicating that regional mestastases do not always occur.

Case III. W. M., a female aged eighteen, complained of hemoptysis and cough of one and one-half years' duration. She was admitted to the hospital on December 5, 1938. One year prior to admission the patient had hemoptysis of a teaspoonful of bright red blood. Five months later she developed a dry, hacking cough. Four months later she again had a severe attack of hemoptysis and was referred to a tuberculosis sanatorium for study. A diagnosis of tuberculosis was ruled out. X-rays on February 3, 1938, showed increased markings in the right middle and lower lobes with apparently a slight decrease in volume of these areas and a moderate shift of the heart and mediastinum toward the right. There was an oval, homogeneous opacity, measuring approximately 2 cm. in diameter, at the level of the seventh interspace extending outward from the right hilum. Radiological diagnosis: "Partial atelectasis, right middle and lower lobes, most likely on the basis of an obstructive lesion near the right hilum. The appearance is strongly suggestive of a new growth." Lipiodol instillation showed a persistent, round shelf lateral to the lower part of the right hilum about 1½ cm. in diameter. There was also a defect in the filling of the lower lobe bronchus although some of the oil passed into one bronchus which was bronchiectatic. Both the middle and lower lobes failed to fill with lipiodol. The impression formed was that there was a bronchial tumor present causing occlusion of the right middle and lower lobe bronchi and a questionable adenoma. Bronchoscopy on December 6, 1938 was reported as follows: "In the right main stem bronchus a tumor mass was seen which practically completely filled the bronchus except for some air passage laterally. This tumor was dark in color, somewhat pedunculated, although firm on pressure, and bled easily with manipulation. Further inspection of the mass showed it to arise, primarily, from the anterior wall of the right main stem bronchus approximately 1½ cm. below the level of the orifice of the right upper lobe bronchus. Diagnosis: Benign adenoma." On January 29, 1939 a right pneumonectomy was performed. A gross specimen revealed two, firm nodules in the middle lobe, one posterolaterally, roughly 2 cm. in diameter which on cut section was dark, red-brown in color and finely granular. The largest one, near the hilum, measured 5 by 3 by 2 cm. Cut surface showed a circumscribed, moderately soft nodule of pinkish-gray tissue. The middle lobe bronchus was opened and projecting from the wall was seen a polypoidal mass, moderately firm, measuring 3 by 1 by 0.8 cm. in diameter. The bronchus distal to this was plugged with mucoid material. A gland measuring 2.5 by 1½ cm., soft and pinkish-gray, was also removed. The microscopic diagnosis of all of these removed specimens was reported, "Carcinoma of low-grade malignancy, suggesting relationship to bronchial adenoma."

Comment. Because of her age and hemoptysis, a diagnosis of tuberculosis was made. Bronchoscopy, however, revealed the proper diagnosis. Bronchoscopic removal was not attempted because of the presence of an intra-pulmonary mass which was visible on x-ray. In spite of the short duration of the disease, metastatic glands were found in the pulmonary hilum. A bilobectomy, removing the middle and lower lobes, would have been sufficient to eradicate the disease, but because of the metastatic growth in the lymph node pneumonectomy was elected.

Case IV. I. S., a male aged fourty-eight, was admitted to the hospital on October 28, 1940. Four years prior to admission he developed an acute pneumonic process on the left side with temperature, productive cough and pleural pain. The following four years the patient had several episodes of pneumonia. X-rays at that time revealed a tumor mass in the left hilum. Patient ran a septic course for three months with high temperature and a large amount of mucopurulent sputum. Bronchoscopy revealed a soft, glistening, reddish-

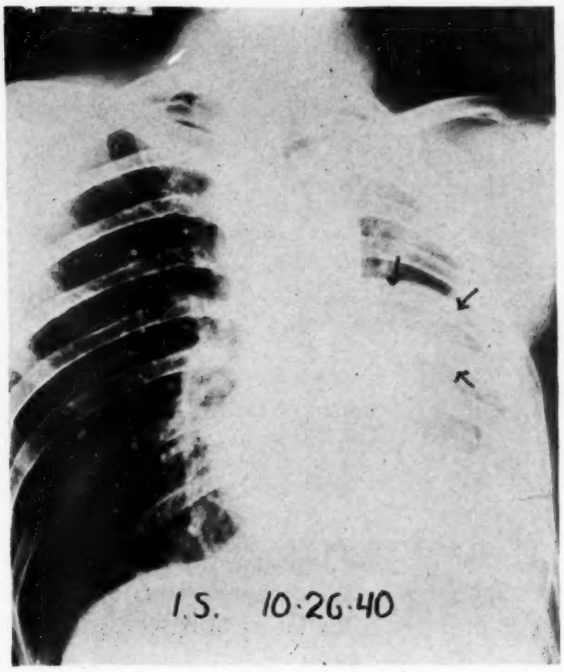


Fig. 6. Case IV reveals large spherical mass measuring 7 cm. surrounding the hilum.

brown tumor mass with a broad base arising from the left main bronchial wall. The histologic report by one pathologist was "chondroma" and by another, "carcinoma." This slide was also seen by Dr. Shields Warren and his opinion was that it was bronchial adenoma. X-ray (Fig. 6) revealed mottled, increased density throughout the left lung field. There was a large spherical mass, measuring 7 cm., surrounding the left hilum. On November 1, 1940, a left pneumonectomy was performed. Gross specimen revealed that there was at the posterior aspect of the upper lobe a rounded mass at the surface which bulged outward. The hilus showed one bronchus filled with soft, glistening, reddish-brown tissue. Vertical section through the above mentioned mass and converging upon the hilus revealed a circumscribed tumor measuring 6 by 4 by 4 cm. in diameter. Its substance was homogeneous, grayish-tan with foci of hemorrhagic disolorations. It extended almost into the interlobar fissure at the apex of the lower lobe posteriorly. The bronchi contained gray fluid exudate. The pulmonary parenchyma showed the most change in the upper lobe where it was indurated.

Comment. Bronchoscopic biopsy was interpreted differently by three pathologists. This proves that the histologic picture is still disputable. The size of the growth and the patient's age were strongly suggestive of malignancy but the history of four years' duration and the absence of regional metastases to lymph nodes were indicative of a slow-growing, benign lesion.

Fig. 7. Case V. This patient was treated by radium introduced with bronchoscope. The residual bronchiectasis and giant cyst are clearly visible.

Case V. V. R. R., a male aged thirty-four, was admitted to the hospital on January 28, 1941. Seven years prior to admission, following appendectomy, the patient developed a cough productive of greenish sputum. He left the hospital on the twelfth postoperative day, complaining of cough and expectoration. Three months later the patient raised a cupful of bright red blood and on numerous other occasions had blood-streaked sputum. During the subsequent five years the patient was unable to work because of dyspnea. X-ray at that time was interpreted as either tuberculosis or lung abscess. A bronchoscopic biopsy was taken at one of the New York cancer institutes and was diagnosed as malignancy. He was treated by x-ray and radon seed implantation and was bronchoscoped twenty times to bring about adequate drainage. Upon admission the patient showed retraction of the left chest with dullness and bronchial breathing. X-ray showed the left lung to be obscured by a dense, homogeneous shadow, except in the upper portion, where there were numerous, small, saccular shadows of diminished density. (Fig. 7.) The left diaphragm was elevated and the mediastinum was shifted toward the left. The refer-

ring physician, in a letter on February 1, 1941 to Dr. Overholt, stated the following: "As you will note, the reports of the section have been contradictory. Two of our best pathologists have made a diagnosis of bronchogenic carcinoma. Bronchoscopic examination, made by me on two occasions, demonstrated a typical pedunculated tumor about 1½ cm., down below the carina, the surface of which was somewhat lobulated but the mucous membrane over it was apparently intact." Our bronchoscopic examination revealed fibrosis with stenosis of the left main bronchus. There were purulent secretions coming from the lower lobe. In 1937, 1,200 R units were administered from June 10th to July 3rd in thirty applications. On July 17, 1938 one gold radon seed, 1.6 microgram, was inserted into the base of the pedunculated tumor. In March, 1939 more gold radon seeds were implanted but at that time the tumor was still visible and it was removed by electrocoagulation. On February 11, 1941 a left pneumonectomy was performed.

Comment. This case was apparently successful by irradiation, radon seed implantations and electrocoagulation treatment. However, the sequelae brought about by the therapy instituted were as serious as the lesion.

Case VI. L. W., a female, was admitted to the hospital on January 10, 1942. Eight years ago the patient had moderate hemoptysis. Following this incident, she had frequent colds with hemoptysis. Five years later she suffered from an attack of pneumonia followed by severe pulmonary hemorrhages. She also complained of chest pain, fatigue, anorexia and weight loss. Bronchoscopy revealed a pedunculated, yellowish tumor mass with a smooth surface arising from the middle lobe bronchus and obstructing the main bronchus. The tumor was hypervascular and bled easily. No biopsy was taken because of the fear of severe hemorrhage. X-ray findings were consistent with chronic pneumonitis. A clinical diagnosis of bronchial adenoma with secondary suppurative changes of the right lower and middle lobes was made. A right pneumonectomy was performed on January 9, 1942. The specimen revealed several lymph nodes in fat and fibrous tissue, the largest measuring 1.5 cm. in diameter. On section these nodes were moderately firm, gray, cellular and contained a large amount of black pigment. The upper lobe was dark purple in color, completely collapsed and soft. The middle and lower lobes were firm and non-crepitant. Within the lung substance, at the hilus, a rounded mass, roughly 5 cm. in diameter, was found. This was compressed and bulged into the bronchus in such a manner as to completely obstruct the middle and lower lobe bronchi. The upper lobe bronchus was unobstructed. On sectioning the tumor was seen to be sharply demarcated, encapsulated and slightly lobulated in contour. The bronchi of the lower and middle lobes were dilated. Microscopic diagnosis: "Infiltrating adenoma of bronchus, lymph nodes negative."

Comment. The important points to stress in this case are: the risk of severe pulmonary hemorrhage during bronchoscopic manipulation, the absence of metastatic regional lymph nodes in a patient in the cancer age group with eight years' duration of the disease and a large extrabronchial tumor.

Case VII. A. J., a male aged nineteen, was admitted to the hospital on October 9, 1942. Duration of the disease was two years. Two years ago the patient had several episodes of hemoptysis, once raising about one-half cupful of bright red blood. However, he remained asymptomatic and well for one year. At that time he developed pneumonia and pleurisy on the right side, associated with wheezing. Roentgenogram (Fig. 8A) showed an area of mottled consolidation in the right upper lobe which extended down to the level of the third interspace. Its lower margin was sharply limited but the area of density was not quite homogeneous. In the shadow there were areas of diminished density which suggested small cavities. The patient was referred to a tuberculosis sanatorium at which time sputum tests were negative for tuberculosis. The patient was treated with pneumothorax. Following the induction of pneumothorax, a complete atelectasis of the right upper lobe occurred. (Fig. 8B.) Because of this finding, bronchial obstruction was suspected and the patient was bronchoscoped. Bronchoscopy revealed a pedunculated mass with gross characteristics of bronchial adenoma arising from the upper lobe bronchus

A B

FIG. 8. A, case VII demonstrates an area of mottled consolidation in the right upper lobe which extends down to the level of the third interspace. Its lower margin was sharply limited but the area of density was not quite homogeneous. In the shadow there are areas of diminished density which suggest small cavities. B, same case as A, demonstrates a complete atelectasis of the right upper lobe following thé induction of pneumothorax.

and extended centrally toward the carina. The bronchoscopic report was, "bronchial adenoma." On October 11, 1942 a right pneumonectomy was performed. The specimen revealed a small, firm, encapsulated tumor mass in the posterior aspect of the right upper lobe branches, growing into the lung parenchyma and firmly attached to the right main bronchus above the upper lobe orifice. In the right upper lobe branch a pinkish-gray nodule of soft tissue measuring 0.4 by 0.5 cm. was found. Microscopic diagnosis was "submucosa irregularly infiltrated by tumor cells, probably originating from bronchial adenoma."

Comment. In tuberculosis sanatoria patients similar to this one are frequently found because of recurrent hemorrhages. A right pneumonectomy was performed instead of an upper lobectomy because of the infiltrating character of this tumor into the main bronchial wall.

CASE VIII. W. L., a male aged fourty-four, was admitted to the hospital on March 29, 1944 because of an acute left empyema which was previously drained. He complained of a chronic productive cough of about one year's duration. The empyema followed an episode of pneumonia on the left side. Following empyema drainage, the patient improved but he continued to have a productive cough, raising about 3 ounces of thick, yellowish, non-odorous sputum daily. There was no history of wheezing or hemoptysis. Because of the persistent cough, the patient had a bronchogram taken which revealed bronchiectasis in the left lower lobe. No bronchoscopy was performed. A left lower lobectomy was performed. The specimen showed a circumscribed, pale mass 1.5 by 1 by 1 cm. filling the lumen of the basilar branch of the lower lobe. This mass which was smooth appeared to be sharply confined to the lumen

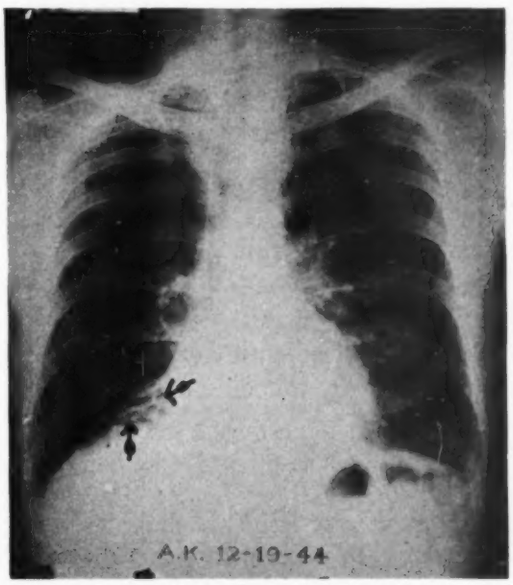


FIG. 9. Case IX demonstrates a triangular area of density at right base in the costophrenic angle. Within this area of density there are small, clear areas which suggest cavities.

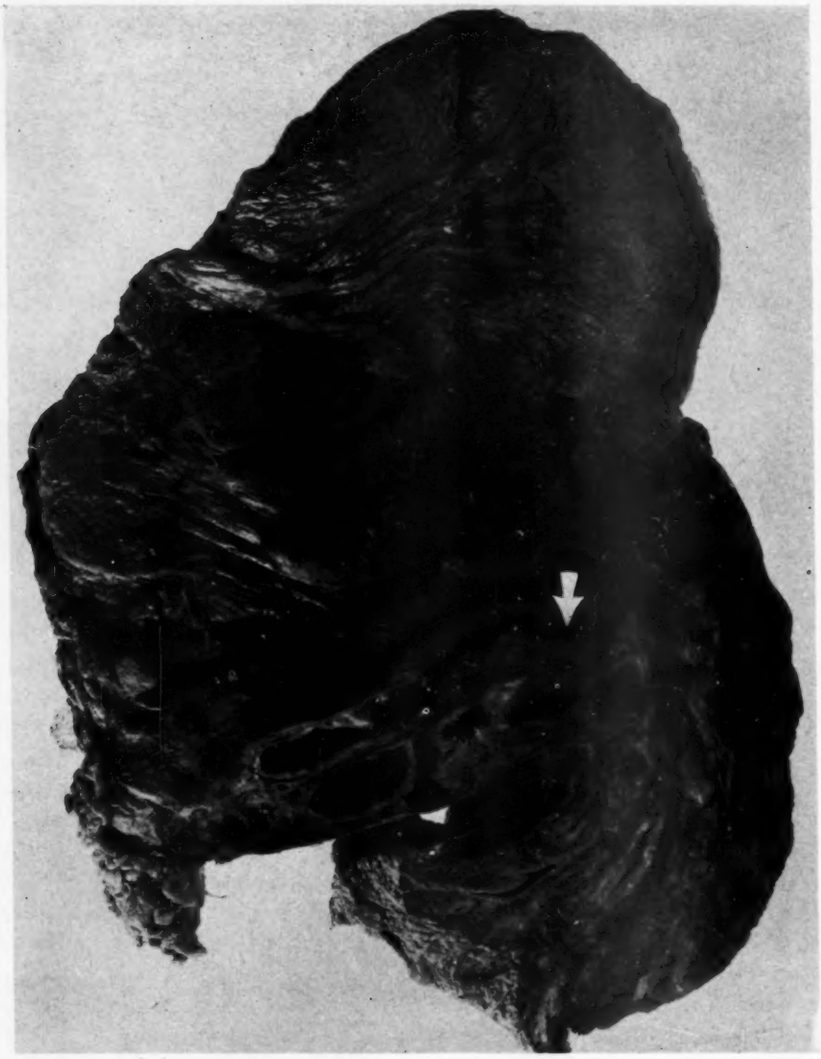


Fig. 10. Case ix. A photograph of specimen demonstrating a soft, friable reddish-gray mass bulging from the middle lobe bronchus and causing nearly complete occlusion of the bronchus. This mass extends into the middle lobe parenchyma, measuring 2.4 by 1.2 by 1.6 cm. in size.

of the bronchus. Distal to this obstruction there were dilated bronchi filled with dark, soft material. Microscopic diagnosis was "bronchial adenoma."

Comment. The value of bronchoscopy cannot be overemphasized.

Case ix. A. K., a male aged fifty-five, was admitted to the hospital on December 20, 1944, with a history of three years' duration, complaining mainly of frequent colds, an average of five episodes each winter with associated cough, temperature and expectoration. Since the previous winter, the patient complained of persistent cough, productive of thick, whitish-yellow sputum occasionally blood streaked for a few days. He also complained of chest pain, dyspnea and a weight loss of 20 pounds. X-ray (Fig. 9) on admission showed a triangular area of density at the right base in the costophrenic angle. Within this area of density there were small, clear areas which suggested cavities. Radiologic diagnosis was "atelectasis and bronchiectasis of the middle lobe." Bronchoscopy revealed a fungating tumor mass at the level of the right middle lobe orifice which bled easily. The lower lobe bronchus was narrowed to about 50 per cent of its normal size. Bronchoscopic biopsy was reported as "bronchial adenoma, infiltrating in type, potentially malignant." This patient was referred to us with a bronchoscopic biopsy diagnosis of

plasmacytoma. A right pneumonectomy was performed on December 22, 1944.

The specimen (Fig. 10) demonstrated a soft, friable, reddish-gray mass bulging from the middle lobe bronchus and causing nearly complete occlusion of the bronchus. This mass extended into the middle lobe parenchyma and appeared circumscribed, measuring 2.4 by 1.3 by 1.2 cm. in size. The bronchi of the middle and lower lobes showed fusiform dilatation. Microscopic diagnosis was "infiltrating adenoma, metastasizing to two of twenty-one lymph nodes."

Comment. This patient had a pneumonectomy because of regional lymph node metastases, the bronchoscopic picture and age.

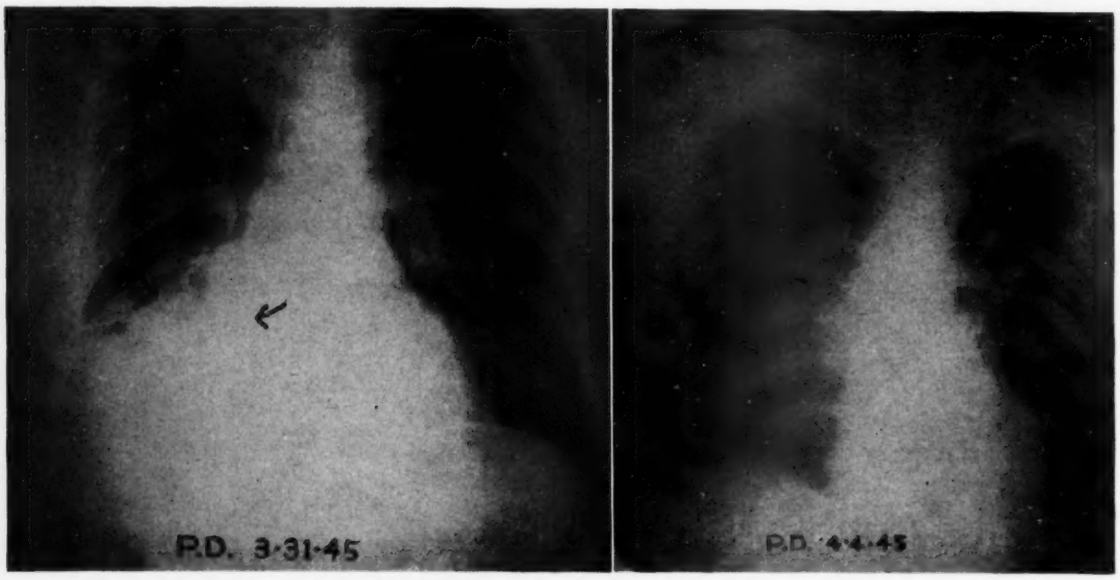
Case x. M. P., a female aged twenty-four, was admitted to the hospital on December 29, 1944. Duration of the disease was two months. The patient was admitted to the hospital complaining of head cold, slight cough, sputum and generalized wheezing. This cough persisted for about one month and became progressively worse. Hemoptysis occurred on three consecutive days, raising large amounts of bright red blood. At that time x-ray was negative. The symptoms subsided for a few days but again appeared. At this time she developed severe chills. X-ray (Fig. 11) then showed atelectasis of the basilar segment of the left lower lobe and emphysema of the superior division of the same lobe. The radiologic impression was atelectasis and emphysema of the lower lobe caused by endobronchial obstruction. Bronchoscopy revealed a tumor mass projecting into the lower lobe bronchus, completely filling the orifice and extending just beyond the orifice of the dorsal division. The tumor was soft and dark red in color. No biopsy was taken because of recent severe hemorrhages. A left lower lobectomy was performed on February 8, 1945. The gross specimen showed atelectasis of the basal division of the lower lobe with emphysema of the remaining segment. A small, smooth, soft, friable mass was found in the lumen of the lower lobe bronchus. Microscopic diagnosis was "infiltrating bronchial adenoma."

Comment. In spite of the short duration of the symptoms the removed lobe revealed permanent, irreparable pulmonary damage

Fig. 11. Case x demonstrates atelectasis of the basilar segment of the left lower lobe and emphysema of the superior division of the same lobe.

in the basilar segment. Bronchoscopic removal was dangerous because of the hypervascularity of the tumor.

Case xi. P. D., a male aged forty-one, was admitted to the hospital on April 28, 1945. Duration of the disease was eleven years. At onset there was severe pulmonary hemorrhage and pleuritic pain in the right chest. Six weeks prior to admission the patient had a severe hemorrhage which recurred six times in one week. Pneumothorax was instituted to stop the bleeding. Previous to this procedure x-ray Fig. 12A revealed an opacity in the right lower lobe suggesting atelectasis. After pneumothorax the entire right lung became atelectatic. (Fig. 12B.) Upon admission roentgenogram still revealed a residual pneumothorax and there was a single lobe which was well expanded. There was a triangular area of density which represented the collapsed right lower lobe. The middle lobe was not clearly delineated. Bronchoscopy revealed a small, rounded, yellowish tumor mass about the size of an almond in the lower lobe immediately below the orifice of the middle lobe. Many varicose vessels were traversing the surface of this tumor. Biopsy was not taken because of a possible hemorrhage.



A B

Fig. 12. A, case XI reveals an opacity in the right lower lobe suggesting atelectasis; B, same case as A, following induction of pneumothorax because of severe bleeding reveals atelectasis of the entire right lung.

The bronchoscopic impression was bronchial adenoma. On May 4, 1945 a lower and middle lobectomy was performed. During operation a very large bronchial artery was seen and also abnormally enlarged vessels were seen in the pulmonary ligament. Gross specimen revealed a rounded, yellowish, shining structure, 0.5 cm. in diameter, which resembled a lymph node and which was located in the right lower lobe bronchus. The lower lobe parenchyma was brownish-purple and meaty in consistency. The bronchi showed an irregular dilatation. The bronchus above the growth and lymph nodes was negative.

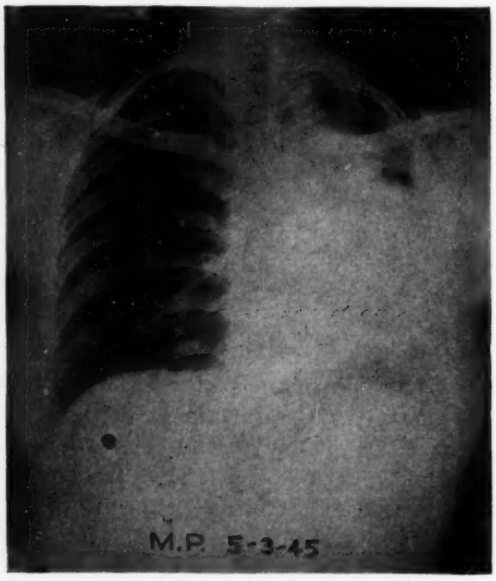


Fig. 13. Case XII reveals opacity of the lower two-thirds of the left lung with multiple clear areas in the left portion of the upper third of the chest.

Comment. Congenital abnormalities were seen in this patient. The middle lobe was sacrificed because of the presence of an entirely fused fissure line.

Case. XII. M. P., a female aged thirty-six, was admitted to the hospital on March 5, 1945. Duration of the disease was fifteen years. Prior to 1930, the patient developed a severe cold associated with pain in the chest, shortness of breath and slight hemoptysis. At that time she was bronchoscoped and a diagnosis of bronchial adenoma of the left lower lobe was made. The patient continued to have severe hemoptysis. In 1940, piecemeal removal of the adenoma was made by repeated bronchoscopic treatments. In all, she had twelve treatments during 1940 and 1941. Throughout 1942 and 1943 the patient complained of a productive cough, fatigue, a dull ache in the left chest and occasional wheezing. X-ray (Fig. 13) taken upon admission revealed asymmetry of the thorax. The lower two-thirds of the left lung was opaque and there were multiple, clear areas in the left portion of the upper third of the chest. The mediastinum was drawn toward

Fig. 14. Case XIII. Photograph of specimen demonstrating the amount of tumor seen through bronchoscope.

Fig. 15. Case XIII. Photograph of specimen demonstrating the amount of tumor after the bronchus was transected.

the left with elevation of the diaphragm. Bronchoscopy revealed a widened carina and there was traction of the left main stem posteriorly and superiorly with a definite narrowing 1 cm. below the carina. The mucous membrane was of normal appearance above the concentric fibrostenotic area. A left pneumonectomy was performed on May 10, 1945. Gross specimen revealed a small lung with extensive fibrosis and bronchiectatic cavitations throughout, with a smooth, round, firm mass adherent to the anterior surface of the main bronchus. On section this growth was 4 by 3 by 2.8 cm. in diameter and encapsulated and arising from the bronchus. The mucous membrane of the bronchi showed hyperplastic changes with no evidence of a tumor. The microscopic diagnosis was "bronchial adenoma."

Comment. The salient features of this case are bronchostenosis, because of repeated bronchoscopic manipulations, pulmonary parenchymal invasion, early pulmonary suppuration and absence of regional metastases in spite of the long duration of the disease. This case proved, definitely, the inefficacy of bronchoscopic removal because only a small portion of the tumor which could be seen through the bronchoscope was extirpated. In this respect these tumors are likened to an iceberg which has only a small portion visible above the surface of the water. Pneumonectomy was indicated because of extensive suppurative changes. If this patient were not finally subjected to surgery because of suppuration, this case might have been reported as bronchial adenoma.

Case XIII. B. R., a female aged thirty-four, was admitted to the hospital on August 12, 1945. The patient had been coughing for many years. The cough was productive of mucoid material. Four and one half years ago she developed an acute pulmonary process associated

with cough, temperature and blood spitting. Three months later the same clinical picture recurred. X-ray of the chest at that time revealed a triangular, opaque shadow in the right chest above the diaphragm. After a course of sulfa drugs the opacity cleared. In January, 1942 she had a third episode of pneumonitis. In March, 1942 a cholecystectomy was performed but no calculi were found. However, since that time until admission, the patient has had a number of similar attacks associated with hemoptysis. Bronchoscopy revealed the presence of a vascular tumor in the right lower lobe which was diagnosed as bronchial adenoma. Bronchoscopy on August 28th revealed a tumor mass (Fig. 14) in the lumen of the lower lobe just below the spur of the middle lobe. It was palpated and bled very easily. No biopsy was taken because of the marked vascularity. At operation a tumor mass the size of a golf ball was palpated in the posterior medial segment of the right lower lobe. The lobe itself, outside of the tumor mass, appeared normal. One enlarged lymph node was found below the carina and a few smaller ones in the secondary hilum. One of the lymph nodes located close to the bronchi was diagnosed on frozen section as "metastatic node, probably from the infiltrating bronchial adenoma." Because of this a right pneumonectomy was performed. The specimen (Fig. 15) on gross study revealed a rounded, smooth, glistening, pearly, gray mass, 3½ cm. in diameter, protruding from the lower lobe bronchus. It appeared to distend the bronchus causing stretching and thinning of the wall. The tumor margin was discrete and sharp but in a few places it was ill defined and gradually extended deeper into adjacent tissues. Miscroscopic diagnosis was "infiltrating adenoma with metastases to one of twenty-four lymph nodes. Sarcoidal reaction of the lymph nodes.

Comment. It is noteworthy to mention that pneumonic lesions in the right base may sometimes simulate typical attacks of gallbladder disease. A pneumonectomy was performed in this case because of the presence of one metastatic lymph node.

Case xiv. E. B., a female aged twenty-five, was well until one year previous to admission at which time she developed three colds in succession, associated with a low grade temperature. X-ray taken at the Middlesex Sanatorium demonstrated atelectasis of the left upper lobe. She entered the hospital complaining of cough, expectoration of mucoid material and fatigue. There was no history of hemoptysis. On January 17, 1946, bronchoscopy showed the upper lobe orifice to be displaced upward with visualization of the lower spur. No abnormalities were seen. A diagnosis of bronchial obstruction, left upper lobe, was made, most likely due to tumor. Bronchographic studies showed an amputation of the upper lobe bronchus. On January 22nd a total pneumonectomy was performed. At operation a completely atelectatic upper lobe was seen and approximately ¼ cm. above the origin of the upper lobe orifice a round, solid, yellowish smooth mass, about the size of a walnut, was palpated. The upper lobe was airless, indurated and approximately two-thirds of its normal size. Enlarged lymph nodes were found in the mediastinum and fissure line. The lower lobe was emphysematous. It was technically impossible to do an upper lobectomy because of the fused fissure line and the presence of many enlarged lymph nodes in the secondary hilum. Microscopic report was "bronchial adenoma, lymph nodes negative for metastasis."

Comment. Adenoma in this case originated in the lobar bronchus at the level of its divisional branches. Because of the location of this tumor, a pneumonectomy was performed. A lobectomy was technically impossible because of the completely fused fissure line.

Case xv. F. R., a male aged twenty-seven. In 1938 the patient developed pneumonia on the right side. Since then, he has had recurrent episodes of pneumonia on the same side followed by chronic cough and expectoration. X-rays taken on three different occasions during the past year demonstrated atelectasis of the right lower lobe. X-ray showed an area of opacity in the right base suggesting atelectasis. Bronchoscopy on March 27, 1946, showed approximately 1 cm. below the middle lobe orifice a tumor mass projecting from the lumen of the basilar bronchus. The mass was yellowish in color, had a smooth surface and bled easily upon being touched. Bronchoscopically, the mass had all the characteristics of a bronchial adenoma and a biopsy was not taken because of

the danger of hemorrhage. A right middle and lower lobectomy was performed on April 1, 1946. The right lobe contained a tumor mass the size of a tangerine which was felt attached to the basilar bronchus. Biopsy of the lymph nodes which were present close to the lesion were negative.

Comment. This case illustrated again that the clinical manifestation of bronchial adenoma may be those of chronic pneumonitis, demonstrating the importance of early bronchoscopic examination. A middle and lower lobectomy was performed because the tumor mass was found to be too close to the middle lobe orifice.

CONCLUSION

We have presented fifteen cases of bronchial adenoma cured by pulmonary resection, ten by pneumonectomy and five by lobectomy. Bronchial adenoma is a disease that should be treated either by lobectomy or by pneumonectomy.

Acknowledgment: Presentation of these cases is made possible through the kindness and cooperation of Dr. Richard H. Overholt, Thoracic Surgeon, New England Deaconess Hospital, Boston, Mass.

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ANALYSIS OF ACUTE CRANIOCEREBRAL INJURIES*

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APPROXIMATELY 6 per cent of all the battle wounds that occurred in the Mediterranean theater in 1944[1] involved the head (exclusive of maxillofacial injuries), whereas, in a series of 1,000 battlefield autopsy examinations it was found that 40 per cent had incurred head wounds of sufficient severity to cause death.[2] This disproportionate immediate mortality from head wounds indicated that early reparative surgery is imperative in this type of injury. The first surgeon to give other than supportive treatment to these patients was the surgeon in a field or evacuation hospital. Throughout the campaign an attempt was made to maintain a neurosurgeon with each forward hospital. This is a report of the author's experiences while acting as the neurological surgeon in a 400 bed evacuation hospital where 4.9 per cent of the hospital admissions had craniocerebral injuries.

GENERAL EVALUATION

At the time of admission the patient with a craniocerebral wound was evaluated much as any other patient. The cardiovascular status was of prime importance. The most useful adjunct for stabilizing the vascular system was found to be whole blood. During the war years of 1942 and 1943, plasma was the substitute of choice, but, with experience, whole blood was found to be of more value. An average of 900 cc. of whole blood was given to each patient with a craniocerebral wound.

The patient was then evaluated from a neurological standpoint. It was found that certain signs indicated a poor prognosis. Pupils that were dilated and fixed to light were significant; five out of eight patients with this sign expired. Patients who maintained extensor muscle spasm in two or more extremities (decerebrate rigidity) offered a poor prognosis; five of the six patients with this sign expired. If consciousness had been maintained at all times, the outlook for survival was certain; there were no deaths in 270 patients. If the patient had been unconscious and had regained consciousness, the prognosis was also good; there were no deaths in eighty-two patients. But if the patient was immediately unconscious following the injury and remained so until the time of operation, the prognosis was poor; twelve out of twenty-nine patients expired. Hemiplegia or abnormalities in deep tendon reflexes (other than spastic paraplegias) were not found to be of significance in the prognosis of mortality; however, reflex changes were valuable in estimating the amount and site of cerebral damage. Patients with diffuse cerebral damage resulting from direct contact with missile or bone fragments or from concussion offered a poor prognosis. The amount of cerebral tissue that herniated through the cranial wound bore very little relationship to the prognosis. Small wounds often permitted no herniation of cerebral tissue nor leakage of blood, consequently, patients with this type of wound often suffered from unduly increased intracranial pressure.

Patients were then evaluated with regard to their general physical status. Associated injuries of the chest, abdomen or extremities were common. Wounds of the chest and/or abdomen took preference over the craniocerebral wound unless it was evident that the patient was suffering either from markedly increased intracranial pressure or a large intracranial vessel was bleeding. The size of the cranial defect was impor-

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tant since a large or grossly contaminated wound required longer operative procedures.

TREATMENT

The patients were observed and given supportive therapy until the vital signs became stabilized, usually sometime within twelve hours, and operative repair was performed at this optimum time; but if a continually downhill course ensued, a craniectomy was immediately performed. It was found that the period of stabilization could be prolonged as long as seventy-two hours without increased danger of infection, but after this period the chance for postoperative infection increased rapidly. Obviously moribund patients were given the benefit of surgery even though no improvement resulted from supportive therapy.

Preoperatively postero-anterior and lateral roentgenogram examination of the skull was always made but not stereoscopic examination because it was found to give very little additional data.

Scalp Wounds. There were 230 patients treated for scalp wounds. These varied from small lacerations to almost complete avulsion of the scalp. Patients with scalp wounds only seldom gave a history of unconsciousness (eleven of 230 cases). During periods of heavy casualties, these wounds were treated by the general surgeons and the neurosurgeon was called only if complications were found. The patients were taken to the operating room, the area around the wound was shaved, cleansed with soap and water and painted with mercresin solution. Strict toilet was considered to be imperative. Procaine solution (1 per cent) with adrenaline was infiltrated around the laceration, or if over the forehead, a supra-orbital nerve block rendered the wound anesthetic. The wound was excised *en toto* and the defect washed with saline solution. The galea and skin were always closed in layers with silk sutures. Skin sutures were removed on the third postoperative day in wounds over the forehead but on the fifth postoperative day in wounds above the hairline.

Simple Depressed Fractures. There were fifteen patients who presented simple depressed skull fractures (closed injuries). Patients admitted to the hospital because of closed head injuries, with or without simple linear fractures, are not included in this series (156 patients). A careful evaluation was made of the size of the depressed fracture and of the neurological signs and symptoms. If the depression were small and the patient asymptomatic, no attempt was made to elevate the fragments. There were eleven patients in this category. These patients were closely observed for later occurrence of neurologic signs. In none of them was subsequent surgery indicated.

In the other four patients craniectomies were performed, because of the large size of the depressed bone or persistent neurological signs such as a hemiplegia. In two of the four, there were lacerations of the dura with a small amount of pulped cortical tissue underlying the fracture. In the other two patients large extradural hematomas were found, evacuated and the bone fragments elevated. The technic used was to place a burr hole adjacent to the depressed fragments and to elevate the fragments with a periosteal elevator. In two of the patients, it was necessary to remove some of the depressed fragments and the defect created by the removal of these fragments was used instead of a trephine hole to introduce the periosteal elevator. A tense non-pulsating dura was considered to be an indication of subdural injury. Dural lacerations were closed with silk sutures.

Compound Depressed Fracture (Non-missile). There were ten patients with compound depressed fractures that were not due to high velocity missiles. The treatment of these patients was similar to that of simple depressed fractures that required operation. These wounds were also carefully débrided, the dura closed and the scalp sutured in layers. In eight of these patients, there were dural lacerations and damage to the underlying cortex but in none of them was there evidence of hematoma.

Compound Depressed Fractures (Missile). There were 126 patients with compound depressed fractures due to high velocity missiles. There was penetration of the dura in 100 of them. The treatment given to the twenty-six patients without dural penetration consisted of excision of the wound of entry, removal of all contaminated bone and closure of the wound without drainage. The 100 patients with missile wounds in which the dura was penetrated were the greatest problem. Table I shows that the majority were due to penetrating rather than perforating missiles. The higher mortality rate for the perforating wounds was probably due to the greater extent of damage concomitant with the higher velocity of the missile. Table II shows the site of entrance of the missiles and the mortality rate. The frontal lobe was most often the site of injury; in fourteen patients both cerebral hemispheres were involved by the missile tract. The higher mortality in these patients with wounds of the frontal lobe may be due to the fact that in all six the missile had penetrated either one or both ventricles or had lodged deeply in the hypothalamic area.

There were ten transventricular wounds; six of these patients expired. In all six, there was concomittant severe damage to the paraventricular structures. None of these patients with transventricular wounds died as a result of intraventricular hemorrhage, perhaps because after operation there was always an exit for the blood other than through the foramen of Monroe. None of them developed a suppurative ventriculitis.

The frontal sinus was involved in twelve patients of whom four died, and the mastoid was involved in four patients, one of whom died because of a concomitant dural sinus injury. The incidence of infection was not increased due to sinus involvement. There were two patients with rhinorrhea following craniectomies for injuries of the frontal sinus, both of whom ceased draining spontaneously within seven days postoperatively. At the time of débridement all loose tissue in the sinus was removed, but intact sinus membrane was not disturbed because it was thought that this membrane acted as a barrier against infection.

In seven patients, a major dural sinus was involved, the sagittal in four, the transverse in two and the sigmoid in one patient. Only one of these died and this was a patient with injury to the sigmoid sinus. Unfortunately in this patient there was an anomalous partial atresia of the left transverse sinus while it was the right sigmoid that had been lacerated. A postoperative thrombosis of this unpaired right sigmoid sinus resulted in death.

At operation, six subdural and two extradural hematomas were found. All of these were on the side of the wound of entrance.

Preoperatively a neurological examination was always done. In Table III, the patients are grouped according to the most

Table I
MISSILE WOUNDS WITH DURAL PENETRATION

Type of Injury	No.	Mortality	
		No.	Per Cent
Penetrating	86	7	8
Perforating	14	5	36
Side-to-side (4)	...	(2)	(50)
End-to-end (10)	...	(3)	(30)
Total	100	12	12

Table II
MISSILE WOUNDS—SITE OF ENTRANCE

Site of Entry	No.	Mortality	
		No.	Per Cent
Frontal	20	6	(30)
Temporal	18	1	(5.5)
Parietal	55	4	(7.2)
Occipital	3	1	(33)
Cerebellar	4	0	0
Total	100	12	(12)

prominent neurological sign observed at the preoperative examination, i.e., a patient with a paralysis of the arm and reflex changes in the leg is grouped under paralysis—arm. Patients with involvement of the reflexes of the leg, arm and

TABLE III
MISSILE WOUNDS—NEUROLOGICAL CHANGES

Neurological Change	Arm	Leg	Arm Leg	Arm Leg Head	Total
Reflex	2	10	32	24	68
Paresis	2	..	12	..	14
Paralysis	4	..	4	..	8
Total	8	10	48	24	90

cranial nerves are grouped under reflex—arm, leg and head. In ten patients no abnormalities were found in the neurological examination. Five patients had an aphasia preoperatively; the aphasia persisted after operation. Two of the patients had an anomia and three had a mixed type of aphasia. In six patients, there was involvement of the retrobulbar visual system.

Table IV reveals the number of patients who were unconscious. A patient was considered to be unconscious only if he did not respond in any visible way to a moderately noxious stimulus (pin prick). Sim-

TABLE IV
MISSILE WOUNDS—STATE OF CONSCIOUSNESS

Site of Injury	Unconscious	Conscious	No. of Patients
Frontal	17	3	20
Temporal	15	3	18
Parietal	45	10	55
Occipital	3	0	3
Cerebellar	4	0	4
Total	84	16	100

ply being unaware of his environment was not considered unconsciousness. There seems to be no specific area of the brain that, when injured, predilected to a state of unconsciousness.

There were twelve deaths (12 per cent) in this group of patients with dural penetration by a missile. Clinical evidence of increased intracranial pressure was present in eight of them, pulmonary edema and/or pneumonia in six, whereas evidence of hypothalamic damage was present in

TABLE V
DATA ON PATIENTS WHO EXPIRED FOLLOWING MISSILE WOUNDS WITH DURAL PENETRATION

Hours from Injury until Hospital Admission	Hours from Injury until Operation	Days from Injury until Death
6	24	9
2	6	20
2	24	8
3	18	14
12	18	2
13	16	3
9	18	6
1	5	2
17	29	10
18	27	28
22	31	23
13	18	5
Average 9.1 Hours	19.5 Hours	8.0 Days

two. In none of the eight patients with evidence of increased intracranial pressure was there evidence of a space consuming lesion at autopsy. Multiple scattered petechial hemorrhages throughout the gray and white matter was a frequent finding. One patient died as a result of a postoperative wound infection. He expired from meningitis on the twentieth day.

Table V shows in these patients who expired, the period of time between injury and hospital admission, operation and death. All patients who expired were rendered immediately unconscious by the missile and did not regain consciousness up to the time of operation.

Preoperatively patients with dural penetration were treated to obtain maximum improvement. The usual methods of combatting shock were carried out. Oxygen was administered by mask or under pressure via an intratracheal tube. The frequently observed pulmonary edema was treated by positive oxygen pressure and

also by repeated tracheal aspirations. Codeine rather than morphine was used to relieve pain. Morphine was not used because of its depressant action and its tendency to obscure neurological signs. The anesthetic of choice was a solution of 1 per cent novocaine containing adrenalin. To unusually restless patients sodium pentothal or avertin fluid was given per rectum or sodium pentathol solution intravenously. These drugs were given to quiet the patient and were not given in analgesic dosages.

The wound of entry was excised and the bone defect enlarged to approximately 4 by 5 cm. except occasionally when larger defects up to 8 by 18 cm. in size were found necessary to visualize the entire dural and brain wound. The contaminated dura was excised, macerated brain tissue was excised until healthy tissue was encountered, and all indriven bone fragments were removed regardless of their location. Metallic fragments that were small and deeply located were not removed unless an evident tract led down to them, but large metallic fragments were always removed even if it were necessary to perform a second craniectomy over the site where the missile had lodged. Tracts were followed across the midline if necessary in order to obtain an adequate débridement. "Lobectomy necessitans" were required oftentimes because of the extent of the damaged brain. An attempt was always made to close the dura; in 46 per cent of the patients it was necessary in order to obtain closure to use some form of graft and for this fascial grafts obtained from the galea, temporal fascia or fascia lata were used. The galea and skin were always closed in separate layers without drainage. Oftentimes a Z-plasty or rotation flaps were required to close the scalp defect.

POSTOPERATIVE CARE

Special postoperative care was found to be important. The total fluid intake was maintained at less than 3,000 cc. daily. Whole blood was the substitute of choice for intravenous therapy. To promote cerebral venous drainage, the head was elevated except for the cerebellar wounds in which the "coma position" as described by Dandy was used. A careful record of pulse, blood pressure and respiratory rates was made and used as a guide in the postoperative care. The bronchial tree was maintained as free of fluid as possible by repeated aspirations and, if necessary to insure a non-obstructed airway, an intratracheal tube was left in place for thirty-six to forty-eight hours. Intramuscular penicillin 20,000 units, every three hours, was given for seven days postoperatively, and whenever a wound extended into a ventricle, 20,000 units of penicillin was instilled into the wound. No sulfa therapy was instituted at the time of operation or later unless penicillin failed to control an infection.

SUMMARY

A report on 381 craniocerebral injuries seen in a forward evacuation hospital is presented. The majority (230) were scalp wounds. The greatest therapeutic problem was presented by the 100 patients with compound depressed fractures with penetration of the dura by a missile. Abnormalities found by the neurological examination are discussed.

Early reparative surgery was performed. A period for stabilization of the vascular system preoperatively was found to be valuable. At the time of craniectomy, the brain tract was thoroughly débrided of all indriven bone fragments. Tight closure of the dura was performed.

There was a mortality rate of 12 per cent in those cases with dural penetration. This included all deaths occurring prior to evacuation of the patient to the United States.

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OSGOOD-SCHLATTER'S DISEASE

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OSGOOD-SCHLATTER'S disease of the tibial tubercle, judging from the usual textbook description and from the relatively few reports in the English literature in the last twenty years, is a fairly rare entity, having a generally typical clinical manifestation, a varied roentgenographic appearance and a frequent defiance for sundry therapeutic measures. This paper was inspired, therefore, because of the discovery of thirteen cases in the short period of nine weeks at a large Naval recruit training center, and because it has become apparent that the roentgenographic appearance of the lesion allows for classification in a manner hitherto unsuggested by investigators of this problem.

ETIOLOGY

It is the common observation among all men dealing with cases of Osgood-Schlatter's disease that trauma to the tibial tubercle is the most frequent etiologic factor found in the patient's history. This trauma may be direct as a result of a fall on the knee, or it may be indirect from violent quadriceps contraction as in running or in kicking. There are, however, a certain number of cases in which a history of trauma is not obtainable. It also seems difficult to understand how the extensive x-ray findings of Schlatter's disease could develop in the few days elapsing between the date of the trauma and the date of x-ray in those few patients who report to their physician immediately after trauma and the onset of symptoms. For these and other reasons the etiology remains a matter of dispute. O'Kane[3] believes there may be two distinct groups of cases, one purely traumatic, the other a case of new bone formation in the patellar ligament. Meyer[4] summarizes most theories as follows: (1) developmental etiology; (2) endocrine dyscrasia; (3) infectious theory (Pease,[17] in 1934, reported a case in which Streptococcus viridans was cultured from a specimen of the tubercle removed at operation); (4) injury. Cole[7] points out that the disease usually appears at puberty and believes it to be a result of stress applied from the quadriceps to the tubercle of the tibia via the patella and infrapatellar ligament at a time when the tubercle can least stand the strain. This may be associated with trauma but, as Cole points out, 66 per cent of his twenty-four patients had bilateral lesions and in their histories trauma had been incurred only on one extremity.

We do not attempt the addition of any new theory to the etiologic riddle but merely state, as have many before us, that the majority of patients date the onset of complaints from some traumatic episode.

PATHOLOGY

Cole[7] and Uhry[10] have reported microscopic studies of sections removed from the area of the tibial tubercle at operation in cases of Osgood-Schlatter's disease. These reports show that early in the disease process there is hemorrhage between the two separated elements in the tubercle. This clot is then gradually organized by the invasion of fibroblasts and connective tissue fibers with the formation of scar tissue. In other sections the two bone plates were seen to be separated by fibrocartilage at which time the sections appeared as a typical fracture with non-union. Cole[7] further describes on gross examination an increased vascularity of the tendon at its attachment to the tubercle, and micro-

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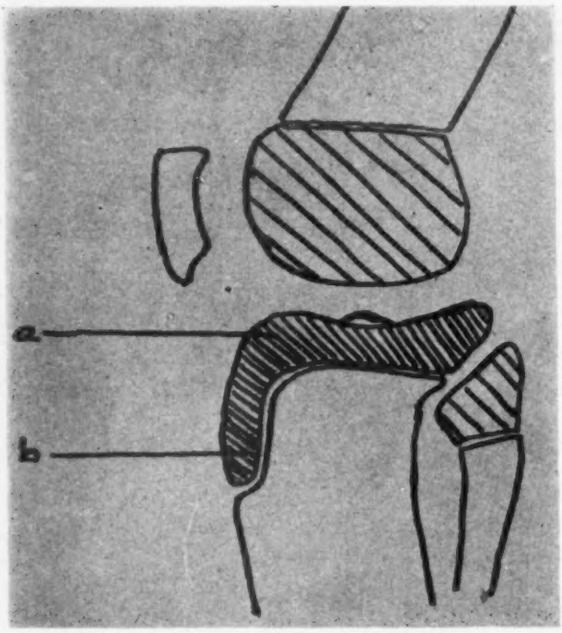


Fig. 1.

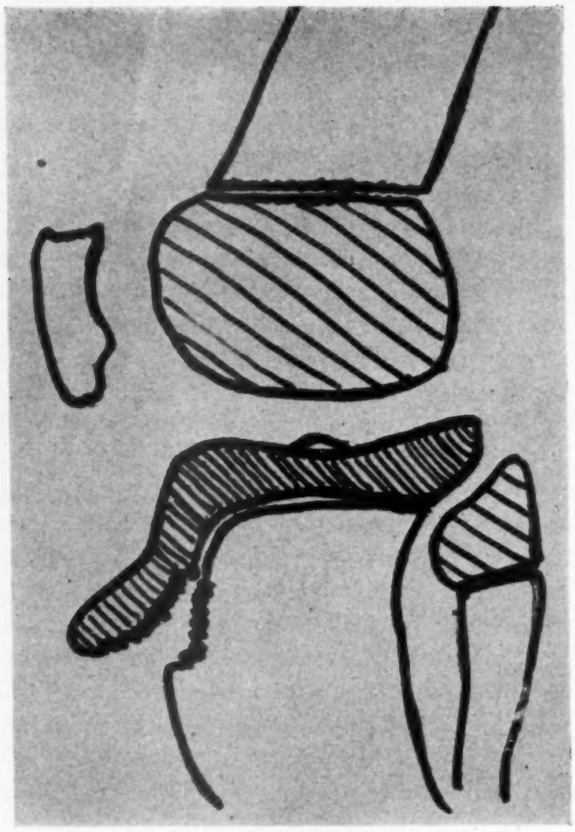


Fig. 2. A, epiphyseolysis.

scopically a roughening and irregularity of the line of attachment of the tendon and tubercle. In contrast, the line of union of tubercle and tendon is smooth and even in the normal individual.

SIGNS AND SYMPTOMS

The diagnosis is often possible from the history and physical findings alone and can be easily confirmed by x-ray examination. As previously stated, the most frequently encountered report from the patient is that following some trauma to the knee (or knees) he noted the onset of pain in the region of the involved tibial tubercle. This pain may be present continually in the far advanced cases, but early in the course of the disease it is present only when a pulling force is transmitted to the tubercle from the quadriceps via the infrapatellar ligament, as in standing in the military position of "attention," kicking a football, running or doing calisthenics. In addition, the patients often complain of pain over the tubercle on kneeling or direct pressure. Objective findings are limited to the area of the tubercle where there is always a moderate to marked degree of soft tissue swelling and bony irregularity. In no case was this enlargement not immediately discernible. Some authors have observed signs of inflammation over the tubercle with redness, increased local heat, tenderness and swelling. (In our series no patient showed any evidence of such an acute process.) There was pain consistently on pressure over the tubercle. If one asks the patient to extend the knee and maintain the quadriceps in contraction, attempting to move the patella laterally will cause pain in the region of the tubercle. In the long standing case it may even be impossible for the patient to contract the quadriceps without pain in the area of the tubercle.

X-RAY FINDINGS

The roentgen anatomy of the proximal portion of the tibia is relatively simple. The proximal tibial epiphysis, as seen in the lateral aspect (Fig. 1*a*), has a tongue-shaped inferior projection (Fig. 1*b*) on the anterior surface, representing a portion of

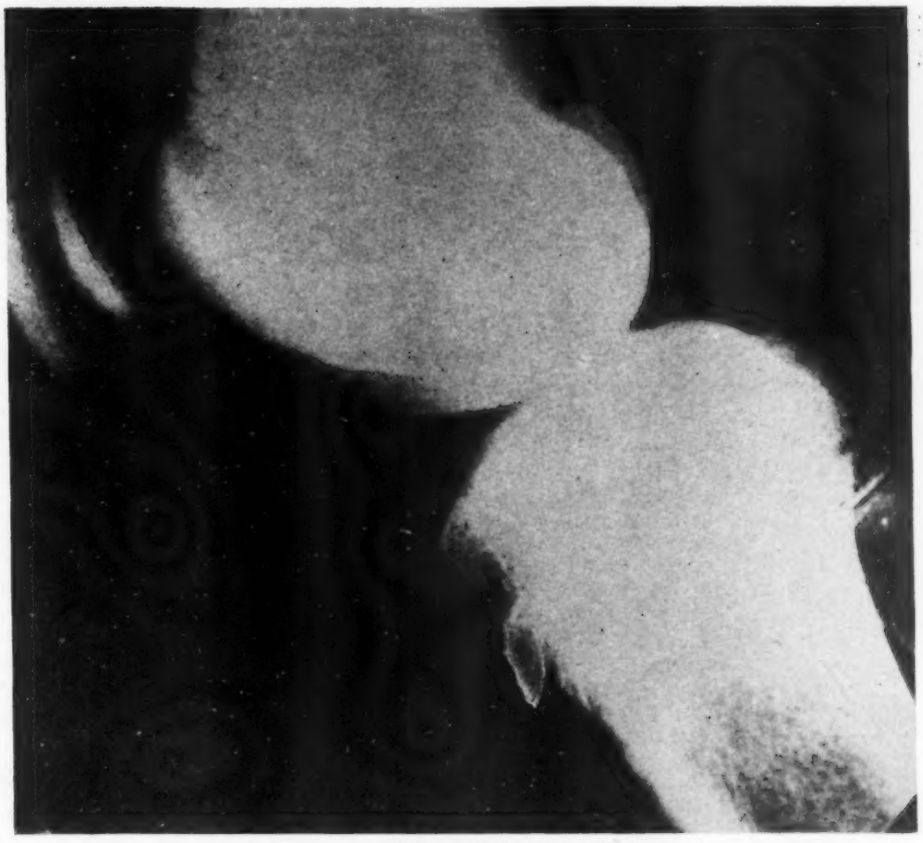


FIG. 2. B, epiphyseolysis (retouched).

the tubercle. The greater portion of the tibial tubercle is included by the epiphyseal line. Ossification of the proximal tibial epiphysis appears just before or just after birth; downward ossification occurs (Osgood) or a secondary center of ossification appears in the tubercle (Schlatter) and the epiphyseal portion of the tubercle begins to ossify at approximately eleven years. Fusion of the epiphysis to the shaft occurs usually by nineteen years. When ossified, the tubercle is a low, irregular elevation on the anterior aspect of the bone 3 to 5 cm. below the articular surface. The superior portion is fairly smooth, the site of attachment of the ligamentum patellae; the inferior portion is roughened, more subcutaneous and there may be a ridge or a depression between it and the superior portion. A groove often delimits the upper edge of the superior portion.

The term "epiphysitis" often applied to the condition described by Osgood in 1903 and Schlatter in 1908 is an inappropriate one since it indicates an inflammatory process. A similar disadvantage holds for "osteochondritis" while "osteochondrosis" is better. For this reason no term thus far used is completely satisfactory.

True Osgood-Schlatter's disease, if the term is to remain in medical language, should be reserved for a necrosing process of the tibial tubercle, with the deposition of osteoid tissue following necrosis and reossification after healing.

The roentgenographic manifestations of Osgood-Schlatter's disease have been variously described. Bosworth[6] describes two acute stages and a chronic stage; the former may be evident by haziness about the epiphysis with extraneous calcification superficial to the tubercle, periosteal elevation or partial epiphyseal separation, and the latter by separate bony structures in the patellar ligament or the tubercle area. Cole[7] finds enlargement of the patellar

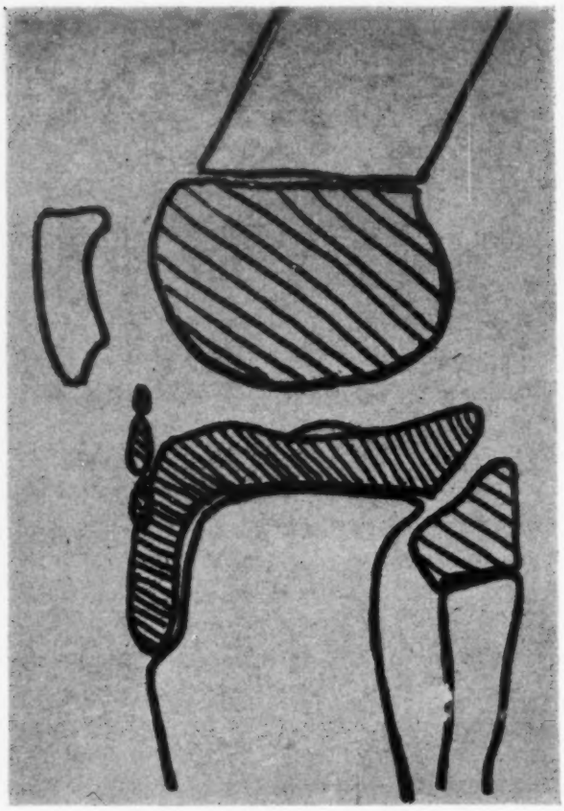


Fig. 3. A, fragmentation.

ligament insertion the first x-ray change. Sutro and Pomeranz[15] describe ligament thickening and bony islands in the ligament.

It has become apparent, therefore, that roentgenographically what is known as Osgood-Schlatter's disease may be one of three distinct processes, all of which probably have the same etiologic factors operating. The first of these, simple epiphyseolysis without fragmentation of the epiphysis, is shown in Figures 2A and B. Fragmentation and necrosis may follow, but the primary process is an epiphyseal separation. This occurred twice in our series. Type 2 is a fragmentation of the epiphysis, with or without epiphyseolysis, but without roentgenographically demonstrable aseptic necrosis of the avulsed fragments. The primary process here is avulsion-fracture of the tubercle. (Fig. 3A and B.) This occurred ten times in our series, two with epiphyseolysis and eight without. The third type, that least frequently seen roentgenographically, corresponds to the usual description of Osgood-Schlatter's disease. (Fig. 4A, B and C.) There is fragmentation of the epiphysis with or without epiphyseal separation and with fragment necrosis. This type occurred only twice in our series. In these latter two types the patella is frequently elevated due to the partial rupture of the insertion site of the ligamentum patellae.

It is at once obvious that epiphyseolysis or fragmentation may be acute processes, the result of recent injury (or whatever the initiating factor may be) or an old process with or without clinical symptoms. The x-ray criteria of activity would then depend on the appearance of the adjacent bony margins at the separated epiphysis, or in serial roentgenograms, changes in bone density, developing lacunae or trabeculae alteration in the fragments or changing size of the fragments. Overgrowth of adjacent bone may occur as a secondary manifestation; thickening of the adjacent soft tissues is frequently present. The "extraneous calcifications" in the tubercle area are, for the most part, actually avulsed particles from the epiphysis.

Thus, any of these three types may be acute (active) or chronic (active or inactive) depending both upon the clinical as well as the roentgenographic findings. With these facts in mind, the following classification of what is generally termed Osgood-Schlatter's disease is suggested:

Type 1. Tibial tubercle epiphyseolysis
Type 2. Tibial tubercle fragmentation
  (a) With epiphyseolysis
  (b) Without epiphyseolysis
Type 3. Tibial tubercle necrosis
  (a) With epiphyseolysis
  (b) Without epiphyseolysis

The differential diagnosis by x-ray offers little problem. When tubercle necrosis occurs, a primary pyogenic infection may be suspected. This is a rare occurrence since that disease is usually primary in the metaphysis with secondary involvement of the epiphysis and adjacent joint. The clinical findings and serial films serve to differentiate. Congenital syphilis often in-

FIG. 3. B, fragmentation.

volves multiple bones and serologic studies aid in differentiating. Acquired syphilitis osteomyelitis and tuberculous osteomyelitis are medullary infections, involving cortical, periosteal and epiphyseal structures secondarily; clinical, laboratory and serial roentgenographic studies would lead to the correct conclusion. A bone tumor would rarely confuse. In the absence of tubercle necrosis, when only simple epiphyseolysis or tubercle fragmentation are present, no difficulties in diagnosis are encountered.

CASES

It will be seen from the accompanying tables that all but two of our patients were seventeen years of age. (Table 1). The cases are classified as to the type of onset, duration of symptoms, the knee involved, presenting symptoms, x-ray findings and those seeking medical attention prior to their naval service. Nine of our patients (69.2 per cent) gave a history of trauma. In only one of these was that trauma described as indirect. This patient dated the onset of symptoms to three months prior to naval service when he had picked up a heavy bundle and had noted pain in both knees. Examination demonstrated bilateral disease.

The average duration of symptoms was 3.5 years and of these thirteen coming under observation in only four (30.8 per cent) had these symptoms been severe enough for them to seek medical advice. One may, of course, wonder if many men would not report to a free navy sick call with symptoms the severity of which would never take them to a doctor were they in civilian life. However, it was our opinion that in the majority of cases these men had legitimate symptoms and according to their statement these symptoms were consider-

ably increased by the working, drilling and exercising on the cement drill fields of the training center.

In Table 1 the symptoms recorded are those which the patients experienced in service. It will be seen that, as expected, left-sided localization of the process. In light of the relatively few recorded cases, however, we believe that if any true evaluation of the frequency of unilateral involvement is to be made one must note any preference of the disease for one side.

TABLE 1

Age	Type of Onset	Symptoms	Years Duration	X-ray	Sought Rx Before	Knee Involved
17	Fall	Pain on marching	3–4	Fragmentation Epiphyseolysis	No	Right
17	Insidious	Pain on marching	3–4	Necrosis Epiphyseolysis	No	Left
19	Football	Pain on marching	4	Fragmentation Epiphyseolysis	No	Left
17	Football	Fatigue marching and calisthenics	3	Fragmentation Epiphyseolysis	Operation and cast	Bilateral
17	Insidious	Painful marching and calisthenics	4	Fragmentation	No	Right
17	Fall, bicycle	Pain, calisthenics	1½	Fragmentation Epiphyseolysis	No	Left
17	Insidious	Painful marching and calisthenics	3	Fragmentation Epiphyseolysis	No	Left
17	Football	Pain stading at attention	3	Fragmentation Epiphyseolysis	No	Right
17	Fall, bicycle	Pain on marching	3	Epiphyseolysis	No	Bilateral
18	Insidious	Weakness marching and calisthenics	3	Fragmentation Epiphyseolysis	No	Left
17	Carrying bundle	Pain on marching	3 mo.	Epiphyseolysis	Yes, no Rx	Bilateral
17	Fall	Pain standing at attention	4	Fragmentation Epiphyseolysis	Yes, no Rx	Right
17	Fall	Painful marching and calisthenics	9	Necrosis	Yes, no Rx	Left

those activities which demand contraction of the quadriceps cause the most discomfort.

Although the literature records no predilection of the disease for one knee, in our cases the left knee alone was involved in 46.1 per cent of the cases, the right alone in 30.8 per cent and both knees in 23.1 per cent. We believe this is too small a series to allow the conclusion that there is any

TREATMENT

Most authors are of the opinion that conservative treatment with posterior splints, cylindrical casting, taping or ace bandaging over the tubercle, and/or bed rest is the treatment of choice in the early case. The consensus favors a trial of such treatment before more radical measures are at-

tempted. There is also a more or less general agreement that in the cases in which symptoms persist beyond four to six months under conservative therapy, operative intervention should be employed if early "cure" is to be accomplished.

Table II

Cases No.	Improved		Not Improved		Made Worse		Unable to Follow	
	No.	%	No.	%	No.	%	No.	%
13	6	46.1	2	15.4	2	15.4	3	23.1

In our series conservative therapy was employed throughout. An attempt was made to follow these men at monthly intervals with a discussion of the subjective improvement and follow-up x-rays. The follow-up period was limited to the short span of six to eight weeks in which the trainee was on the station and in no instance did this actually exceed six weeks. In no case was there any x-ray evidence of regression of the lesion on the follow-up film nor was any expected. Nevertheless in Table II one will note that subjective improvement was obtained in 46.1 per cent of the patients under treatment, 15.4 per cent showed no improvement, 15.4 per cent were made worse and in 23.1 per cent we were unable to make any follow-up studies.

Figure 5 is an illustration of the type of therapy employed in all our cases. It must be remembered that it was impossible to employ bed rest or in any way restrict the activity of the men in this series. Our patients passed through their "boot" training with no lightening of their duties in any respect. In such a case one will realize that it is impossible to restrict completely the motion of the involved joint and expect a man to march with his company, do calisthenics and the other physical activity necessary to keep up with the rest of his unit. Our therapy was, as in all conservative therapy, directed toward relieving the pull of the quadriceps on the tibial

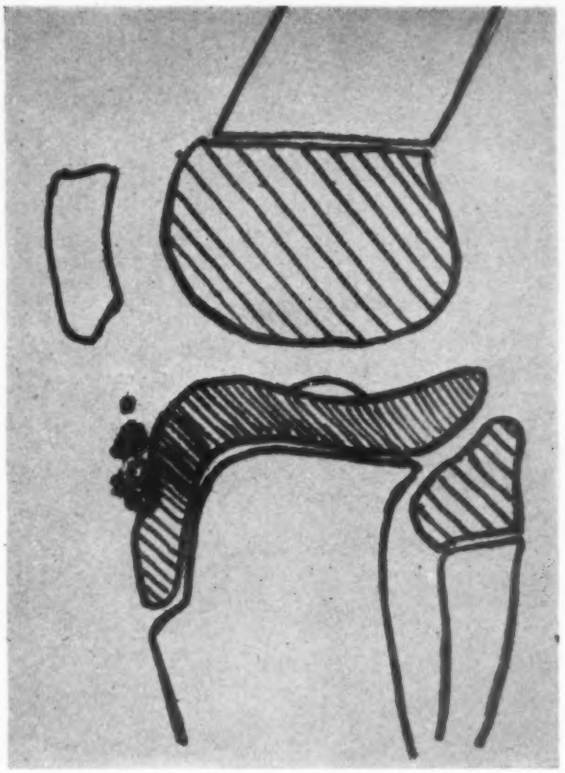
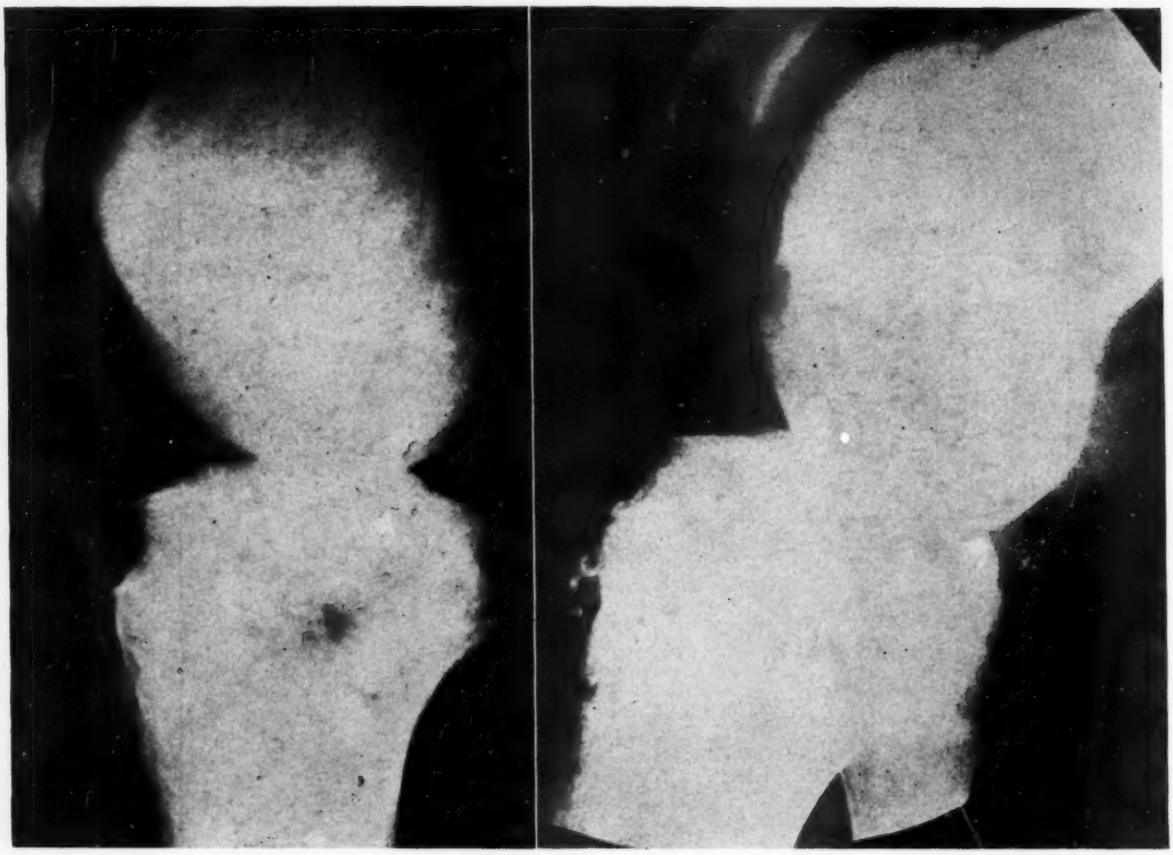


Fig. 4. A, necrosis.

tubercle. This was attempted with cross strapping as diagrammed, and in some cases the employment of a circular ace bandage around the tubercle area. The greatest difficulty was the fact that in the vigorous exercise necessary in the man's daily activity the taping would seldom stay in place for more than forty-eight hours. In all cases, however, the tape was continually reapplied as long as the skin irritation did not form a contraindication. In light of the aforementioned difficulties encountered in treatment we believe that an observed 46.1 per cent improvement in this group is of some significance.

The tape was applied in the following manner: With the patient sitting, the leg was placed in relaxed extension by allowing the heel to rest on a low stool without supporting the knee, after shaving the leg and applying compound tincture of benzoin to the skin. The cross tapes were applied from above downward with the traction force being applied downward in an attempt to relax the tension on the infrapatellar tendon



B C

FIG. 4. B, necrosis; C, necrosis (lacunarization and area of increased density).

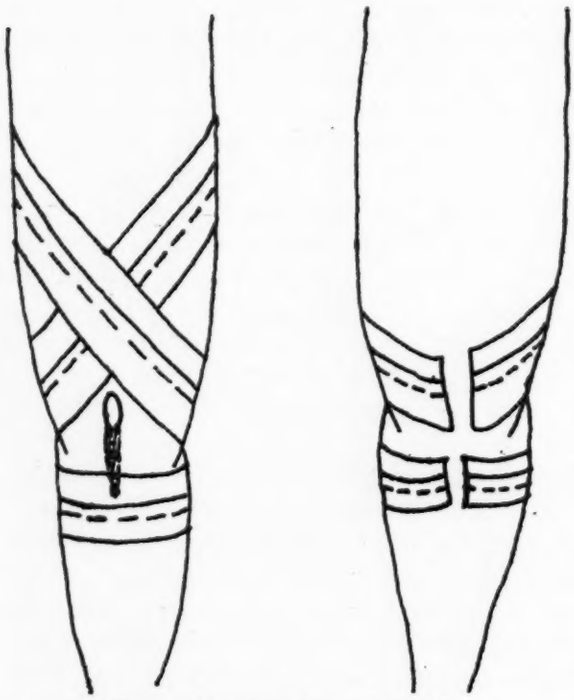


FIG. 5. Diagram of cross strapping.

and insofar as possible limit flexion of the knee. In addition, tape was applied in a circular fashion over the tubercle itself. In all cases we were careful not to encircle the extremity completely with tape.

COMMENT

It seems practically impossible to make any even relatively accurate estimate of the incidence of Osgood-Schlatter's disease in the general population, but the appearance of the thirteen cases of this series in nine weeks seemed to us an unexpected number. We have attempted an estimate (admittedly very rough) of the general incidence of this disease among the young men of the Center. All inductees arriving at the station were quartered in one division of the Center and reported to one dispensary for sick call. During the period of nine weeks covering this study approxi-

mately 1,024 men per week entered the Center which represents an incidence of 0.14 per cent of the general population of young males between the ages of seventeen and nineteen. It is well to remember, however, that this percentage might be somewhat higher at the age of puberty when the disease is reported to be seen most frequently. Certainly the cases reported in the literature are predominently at the age of puberty. Wilson, Fishell and Lagasa[5] report the incidence of Osgood-Schlatters disease to be 7 per cent of all knees examined in a New York hospital. To our knowledge, however, no one has attempted an estimate of the general incidence in the young male population and ours is at most an estimate.

SUMMARY

Thirteen cases of Osgood-Schlatter's disease seen in a period of nine weeks at a large Naval recruit training center are presented with a report of the x-ray findings and treatment, the latter was instituted while the patients were ambulatory and without restriction of their activity in any way. Forty-six and one-tenth per cent showed subjective improvement under anterior thigh taping as described, 15.4 per cent were not improved, 15.4 per cent were made worse and in 23.6 per cent we were unable to follow the patients. A roentgenographic classification is suggested and a rough estimate of the incidence of Osgood-Schlatter's disease among young males is submitted.

CONCLUSIONS

1. Osgood-Schlatter's disease may be precipitated and/or the symptoms aggravated by the increased exercise carried on during Naval training.

2. The doctor dealing with young men engaged in vigorous exercise should be conscious of the fact that in the young military-age group the incidence of this disease may be greater than in general practice.

3. Military personnel may be definitely improved by conservative measures even if limitation of activity and complete limitation of the knee joint motion is impossible.

The authors gratefully acknowledge the technical assistance of William W. Ryle, HA2/c USN, Medical photographer.

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TREATMENT OF CHRONIC ULCERS WITH CHLOROPHYLL*

REVIEW OF A SERIES OF FIFTY CASES

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THE large number of articles found in any one year's volume of medical literature on the treatment of chronic ulcers of varicose, diabetic, arteriosclerotic or other etiology, indicates that no one method of treatment has been found entirely satisfactory. Any addition to this mass of literature is, therefore, only justified if the series of cases treated is of significant size and the results obtained in that series are better than average.

Economically, chronic ulcers constitute an expensive medical problem. On the part of the patient they require frequent visits to the doctor over a prolonged period of time. Incapacity and absence from work is often a considerable item and the lesions often necessitate an outlay of considerable money in the purchase of dressings, bandages and various ointments. For the hospital such patients hinder rapid turnover because treatment is prolonged, and they place a burden on the nursing facilities because of the individual care which they demand.

Because of the inherent chronicity of ulcers, it has been the aim of all methods of treatment to effect healing as early as possible. Any new therapeutic preparation should contain agents which will increase the rate of healing. Many such substances have been proposed, yet their very number suggests that no one of them is uniformly successful.

Recently, as a result of the experimental work of several investigators,[1–6] the water-soluble derivatives of chlorophyll have been shown to possess tissue-stimulating properties. Smith and Livingston,[7] in a series of 1,372 experimental lesions produced in animals and treated with chlorophyll, showed healing time to be decreased by approximately 25 per cent in over two-thirds of their cases. These results together with other clinical reports concerning chlorophyll therapy were so impressive that it was thought worth while to treat a series of chronic ulcers with this material in an attempt to corroborate clinically their experimental findings. An historic review of our knowledge of chlorophyll in medicine was published by one of us (W.S.M.)[8] in July, 1946. Boehme[9] reported a series similar to the present study in April, 1946.

MATERIAL AND METHODS

From October, 1945 to August, 1946, fifty patients with chronic ulcers received topical treatment with a hydrophilic ointment containing water-soluble derivatives of chlorophyll. Of these, twenty-eight have been cases of varicose or stasis ulcers, six arteriosclerotic ulcers, six diabetic ulcers, five decubitus ulcers, two malignant ulcers and three ulcers of uncertain or undetermined etiology. Eighty-five per cent of the patients had been referred to the clinic because of intractable pain, failure of healing or for other reasons. In some the ulcers were a complication of a more primary disease: diabetes, congestive heart failure and spinal cord lesions.

The method has consisted in the local application of Chloresium ointment.* The ointment was applied in moderately generous quantities to a large square dressing which was then placed over the ulcer area and held in place with simple bandaging. Initially, dressings were changed every second day. Later the routine was modified and application of the ointment was made

* The Chloresium ointment used in this investigation was generously provided by the Rystan Company, Inc., Mount Vernon, N. Y.

* From the Department of Medicine, Guthrie Clinic and Robert Packer Hospital, Sayre, Pa.

daily because it was found that dressings left unchanged for two days tended to become dry and it was thought that this decreased their therapeutic value. In the earlier cases with gross infection, 100,000 units of penicillin were added to a 1 pound jar of the Chloresium ointment. This was found adequate to control the markedly infected cases. Actually, however, most cases showing a moderate amount of purulent drainage cleared up so promptly with the chlorophyll ointment alone that during the latter two-thirds of the series no penicillin or other antibacterial agents were added to the Chloresium ointment. Smith's experimental findings appear to indicate that water-soluble chlorophyll itself is a mild antibiotic and probably increases tissue resistance to the action of bacteria.

In extremely painful lesions the dressings were changed several times daily during the first few days of treatment because it was found that by so doing the lesions became painless more quickly. Redressing more often than once daily was seldom necessary, however, because the soothing effect of a single application will usually last for twelve to eighteen hours. In attempting to evaluate the effectiveness of the chlorophyll preparation the other measures used in the treatment of ulcers were avoided with but few exceptions. Three patients in the series with varicose ulcers had saphenous vein ligation and this accepted surgical procedure was recommended subsequently to all suitable patients with varicose veins. We abstained conscientiously from the use of pressure bandages, radiant heat, boots, etc., to avoid obscuring the results. When the general condition of the patient permitted, he was given ambulatory privileges and 30 per cent of the cases in this series were treated as out-patients, pursuing their more or less usual activities and occupations during treatment.

RESULTS

We have been gratified and encouraged by the results that we have observed in this series of cases. (Table 1.) As has been mentioned approximately 85 per cent of the patients had been referred to the clinic by general practitioners, over a radius of about 150 miles, because they had constituted long, chronic and refractory problems in therapy. A few others had been treated with inadequate success over a long period of time by our own out-patient department. Most of the patients had received a variety of therapeutic measures, including prolonged periods of bed rest in a number of instances.

TABLE 1

Etiology	No. of Cases	Improved*	Unimproved*	Healed†
Varicose and stasis...	28	28	0	20
Arteriosclerotic.....	6	5	1	3
Diabetic.....	6	5	1	3
Decubitus.....	5	4	1	2
Malignant.....	2	2‡	0	0
Undetermined.....	3	3	0	2
	50	47	3	30

* Based on a period of observation varying from one to four months.

† Based upon follow-up examinations or communications of forty of the patients two to seven months after treatment.

‡ The term "improved" in the case of malignant ulcers indicates a decrease in the local discomfort, odor, infection and induration; not, of course, decrease in the malignant process.

It appears to us that in general, patients with the greatest degree of vascular insufficiency showed the poorest response to chlorophyll therapy as might well have been anticipated. Healing time was almost in direct proportion to the degree of vascular involvement. Diabetic ulcers, in patients showing a considerable amount of arteriosclerosis, took longer to heal than those having only one or the other of these conditions. In one patient having syphilis, diabetes and arteriosclerosis no acceleration of the healing time was noted. Yet even those patients with maximal involvement of the vascular tree and whose lesions had been stationary or progressive for months

or years showed progressive healing although complete closure of the ulcer was less prompt than in those with better preservation of their peripheral circulation. The varicose and stasis ulcers responded best of all and in some of these the effect of chlorophyll was often quite remarkable.

It has been our observation in this series of chronic ulcers that water-soluble chlorophyll therapy satisfies two of the primary requirements of the "ideal" substance for the treatment of this condition: It relieves the subjective symptoms which are secondary to the ulcer and it promotes tissue growth and healing in the majority of cases. In persons who complained of pain from the ulcer this was quickly alleviated by application of the chlorophyll ointment. In a few dramatic instances patients volunteered the information that for the first time in weeks or months they were comfortable and slept soundly during the night following their admission and the application of the ointment. As a rule pain was no longer a problem after several days' treatment and sedation could be discontinued after the first twenty-four or forty-eight hours. No untoward local reactions were experienced although one patient complained of an unexplained burning pain at the ulcer site for a few minutes after the first application of the ointment. The relief of such associated symptoms as pain, itching and burning due to stasis dermatitis, burns, wounds and a variety of other conditions has been mentioned in separate reports by Langley and Morgan[10] and Morgan.[11]

The objective evidence of healing was apparent in every patient except three, two of them having malignant ulcers; the criterion for healing is an appreciable and measurable decrease in the size of the ulcer. It was uniformly noticed that shortly after therapy was begun the tissues took on a healthier appearance and new granulations were visible. The inflammation and tenderness was diminished as a rule and often completely disappeared. Ulcers which were secondarily infected and foul-smelling were relieved promptly of both the discharge and odor after application of the ointment for a day or two. When there was an accompanying stasis dermatitis, this uniformly improved.

ANALYSES

Twenty-eight cases of varicose and stasis ulcers were treated. All of the patients showed improvement and twenty of twenty-four patients who could be followed for two to seven months remained healed. Saphenous vein ligation was performed in only three subjects although it was recommended in all suitable cases.

Six patients with ulcer of the lower extremities of arteriosclerotic etiology received similar treatment. Only one patient in this group did not show improvement. This was a sixty-five year old male who had had an amputation of the left leg several years before because of arteriosclerotic gangrene. He was re-admitted because of gangrene of the right great toe. Débridement of the necrotic tissue and application of chlorophyll ointment for about one month, together with the usual supportive measures, failed to produce appreciable improvement and amputation of the toe was performed. A somewhat similar case (Case II) did show a good response and complete healing occurred.

Six diabetic ulcers were treated with Chloresium ointment. Three of these healed promptly. One patient with associated syphilis and advanced arteriosclerosis showed very slow healing. One showed progressive improvement but incomplete healing, presumably because of an associated osteomyelitis. The sixth patient showed no benefit from an intensive two-week's trial. This patient was a diabetic of twelve years' duration with an ulcer for two years. Roentgenograms showed marked arteriosclerosis of the arteries of the feet. Diabetes had been controlled elsewhere with no effect on the ulcer. It was suspected, although not proven, that this patient's ulcer was complicated by the presence of an inadequately draining sinus. (Case III.)

Five patients with decubitus ulcer were treated. These are the most difficult of all ulcers to treat and the results achieved with the chlorophyll ointment were satisfactory but not spectacular. All except one of the patients improved both subjectively and objectively as shown by progressive decrease in the size of the lesions. Only two patients showed complete healing and one case, a woman forty-four years old with an inoperable spinal cord tumor who had both urinary and fecal incontinence, was considered a failure. This patient died of urinary tract and pulmonary sepsis. It was observed, however, that water-soluble chlorophyll served to alleviate pain and produced a much healthier ulcer than any therapy previously employed; granulation tissue formation with healing occurred although at a much slower rate than was noted in ulcers of other etiology.

Two malignant ulcers were treated, one before and one after the diagnosis of carcinoma was established. The initial biopsy from the first case reported only chronic inflammatory tissue. The chlorophyll ointment produced subjective benefit and seemed to reduce the amount of inflammatory reaction around the ulcer. A second biopsy showed basal cell carcinoma of the cheek and the patient was treated with roentgen therapy. The second patient had ulcerative squamous cell epithelioma of the left knee, confirmed by biopsy, on whom several skin grafts had been applied at another hospital. This patient's lesion was extensively infected and extremely foul-smelling. The application of chlorophyll ointment rapidly eliminated the odor, cleaned up the infection and produced new granulations in the base of the ulcer. X-ray therapy was then given but a recurrence developed for which mid-thigh amputation was required.

Three ulcers in which an etiologic diagnosis remained in doubt received chlorophyll therapy. The first was a man sixty-five years of age with no apparent arterial or venous insufficiency of the extremities who had had repeated admissions because of recurrent indolent ulcers of the right lower leg. The lesions had a surrounding dermatitis and a similar dermatitis of the thighs and arms. A great variety of therapeutic agents had been used, including irradiation. An equally extensive variety of diagnoses had been applied, including lichen planus, lichen simplex chronicus, lichen vidal, dermatitis factitia and dermatitis venenata. The patient was treated for twenty-one consecutive days with chlorophyll ointment. He was discharged with the indolent ulcer practically healed and was given a supply of the ointment for home applications. A subsequent letter dated nine months later stated that the ulcer had remained healed and quiescent. This was the longest remission that had been recorded since his first appearance at the clinic three years previously.

The second of these ulcers of undetermined etiology occurred in a woman forty years old who for twenty years had had many ulcers of the left lower leg which had healed and had repeatedly broken down. She has been repeatedly treated at the Robert Packer Hospital since July, 1944 with Unna's boots, red cell paste, elastic bandages, etc., with temporary improvement. Varicose veins were considered the cause of the ulcers but were never proven and none were apparent. Her most recent admission was from March 6th to April 21, 1946. On this admission the patient had an ulcer which almost encircled the left leg above the ankle and which had been present for eight months. Six weeks of treatment with chlorophyll ointment caused rapid decrease in the size of the lesion by about 50 per cent but thereafter healing became extremely slow. It was believed that the ulcer was probably ischemic in nature although the exact etiology was unknown. Serologic tests for syphilis were negative in this and in the other two patients of this group with uncertain etiology. Other laboratory studies were likewise non-contributory.

The third of these indolent ulcers of undetermined etiology was observed in a man

of forty-three years who for five years had had recurrent superficial ulcerations of both ankles. When admitted to the hospital, he had an open ulcer over the internal malleolus of each leg. That on the right measured 4 by 10 cm. and had been present for two years. The one on the left measured 2.5 by 2.5 cm. and had recurred following a bruise of the left ankle three months before. Local and general physical examination were negative. The lesions had been treated for some months in the out-patient department with gentian violet and other local applications but without significant results. The patient was hospitalized for five days' therapy and continued treatment as an outpatient. On an ambulatory status both ulcers gradually improved and when last seen, eight weeks following admission, the ulcer on the left leg measured 1.5 by 1.0 cm. and that on the right was 2 by 2 cm. Both had become asymptomatic and had shown progressive diminution in size in spite of the fact that the patient has continued to work forty hours weekly as a bench worker in a machine shop.

CASE REPORTS

Case I. A sixty-nine year old white female was admitted to the hospital with arteriosclerotic heart disease and congestive heart failure. Examination disclosed the additional presence of a painful chronic ulcer of the left leg. The patient stated that the ulcer had been present for the past thirty-four years during which time it had never healed. It had occurred spontaneously following a "milk leg" which appeared subsequent to childbirth. Healing had failed in spite of repeated efforts by various methods and by physicians since the time of its onset, and during this time there had been several periods of complete bed rest. Examination of the left lower extremity revealed a small ulcer measuring 2 by 2 by 0.5 cm. on the superior portion of the internal malleolus. The base of the ulcer was grayish in color, unhealthy in appearance, although not frankly infected, and was quite tender to touch. The ulcer was surrounded by an area of inflammation and by a large zone of chronic scarring and hyperpigmentation. Numerous varicose veins were present in both legs. The arterial pulsations were normal.

The ulcer was dressed daily with chlorophyll-penicillin ointment. Progressive healing was noted from the start of treatment. After several days the surrounding inflammation had disappeared and much of the tenderness was relieved. Eight days after treatment had begun the ulcer measured about 0.5 cm. in diameter and six days later it was completely healed. Inasmuch as the danger of recurrence of the ulcer was so obvious, it was recommended that saphenous ligation be performed. This was done after healing of the ulcer was complete. The patient was discharged from the hospital two days later. Follow-up examination four months later indicated no signs of recurrence of the ulcer. (Fig. 1.)

Comment. The case of a patient with a thirty-four-year old ulcer which healed in fourteen days is described in some detail largely because of the outstanding result. It was the best result in our series of twenty-eight stasis ulcers although several others approached this in their rate and manner of healing. One varicose ulcer of three months' duration healed in eight days. Two others healed in nine days whereas one required four months. In a condition with so many variables of severity, age and associated conditions an "average" loses its meaning and statistical importance but, as the series of cases increased, we formed the clinical impression that chlorophyll ointment produced better and quicker results than measures previously used.

Case II. A seventy-four year old farmer was admitted to the hospital on October 23, 1945, because of arteriosclerotic gangrene of the right great toe. About three months earlier the patient noted discoloration of the nail and base of the toe. This became worse in appearance, progressively more painful and interfered with the patient's sleep. The toenail was removed by his physician at home and ointments were applied without relief of pain or change in appearance. For two weeks prior to admission there had been considerable swelling of the ankle and foot.

Physical examination showed a well pre-

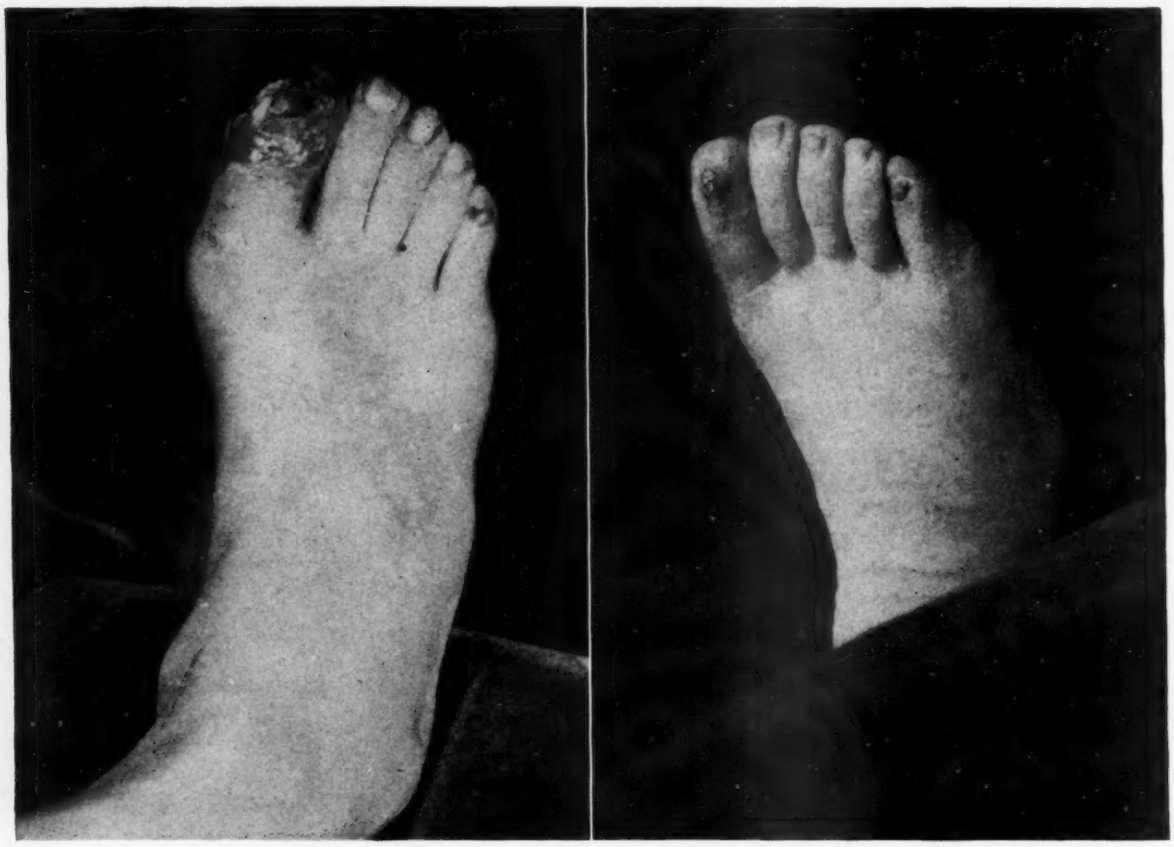
A B

Fig. 1. A and B, showing the degree of healing of the ulcer in Case 1 over a two-week period.

served, elderly white male who did not appear acutely ill but obviously was in considerable pain. Blood pressure was 140 systolic, 85 diastolic, the pulse rate was 76 and the temperature was 98.6°F. Positive findings were limited to the extremities. Dorsalis pedis and posterior tibial pulsations were absent in both feet. The right foot showed a large, black slough covering the surface of the great toe; the nail was gone. A line of demarcation was present near the base of the toe and there was considerable inflammation of the adjacent area of the foot. Although the pulses were absent, the feet were not strikingly cold and there were good popliteal and femoral pulses. Sclerosis of the radial arteries was marked.

The patient was given bed rest, vasodilating agents, sedatives and Buerger's exercises. The slough was softened with warm saline soaks and part of this dead tissue was removed seven days after admission. Chlorophyll ointment was applied thereafter every second day, and by the end of ten additional days the pain had decreased, the color was markedly improved and purulent discharge had ceased. The patient was discharged from the hospital on November 10th and given a supply of chlorophyll ointment and dressings for treatment at home.

He was readmitted eighteen days later. The foot was of good color but there was an area of hard eschar on the dorsum of the toe which it seemed desirable to remove. The eschar was softened with Chloresium solution for three days and then was excised. Thereafter, chlorophyll ointment was applied every second day and after six days the patient was comfortable and able to walk to the bathroom. The ulcerated area was granulating and had a healthy pink color. Adjacent inflammation was absent. Granulation and healing progressed and on December 22nd the patient was discharged, twenty-four days after his second admission. He continued to be ambulatory at home, applying chlorophyll ointment daily, and returned to the clinic at weekly intervals. By January 19, 1946, the toe had completely healed and the patient was comfortable and free from pain. He was advised regarding protection of the foot from cold and trauma. A letter from the patient dated June 3, 1946, stated that the toe had remained healed and that he had resumed part of his farm work,



A B

Fig. 2. A and B, an arteriosclerotic lesion of the right great toe treated for nine weeks with chlorophyll ointment, showing the degree of healing (Case II).

doing the chores and driving the tractor. (Fig. 2.)

Comment. Although healing in this case required eighty-eight days of observation and treatment, we believe that conservative therapy was warranted since the patient ultimately had a useful and comfortable extremity. After the slough and eschar had been removed, so that the ointment could contact more viable tissue, we gained the impression that chlorophyll added appreciably to the rate of healing and the alleviation of pain.

Case III. A sixty-three year old white, diabetic female was admitted to the hospital April 26, 1946, because of a painful ulcer near the base of the right great toe which had not responded to treatment by her local physician. The patient had had diabetes for six years and the ulcer had appeared about four months before admission, following slight trauma. Her initial blood sugar was 246 mg. per cent. The diabetes was controlled with diet and protamine zinc insulin. The ulcer was treated for two weeks with plain sterile dressings following excision of a small area of necrotic tissue. A roentgenogram showed probable osteomyelitis of the terminal phalanx. No change in the size of the ulcer occurred and it remained painful. Daily dressings were begun, using chlorophyll ointment. The lesion became more comfortable and healing began. The ulcer was entirely healed in ten days and dressings were discontinued. The patient was seen fifteen months after discharge from the hospital and there had been no recurrence of the ulcer. She remained active in her housework and was comfortable. (Fig. 3.)

Comment. Bed rest and control of the diabetes may have played a part in the healing of the ulcer. Nevertheless, healing was not apparent until the therapeutic regimen included the daily application of chlorophyll ointment, and it appeared to

A B

FIG. 3. A and B, results of treatment of a diabetic ulcer of the right great toe over a perjod of ten days with local application of chlorophyll ointment (Case III).

us that this agent contributed to the rapid healing.

SUMMARY

Gratifying results have followed the application of an ointment containing the water-soluble derivatives of chlorophyll (Chloresium) in a hydrophilic base in fifty indolent ulcers.

Subjective relief of symptoms was expressed by every patient during the course of treatment.

Objective evidence of healing was noted to an appreciable degree in all except three patients.

We believe that chlorophyll therapy should have a place in the management of chronic ulcers although it cannot be used to the exclusion of other recognized methods of medical and surgical management.

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GASTRIC DIVERTICULA*

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THE presence of diverticula in the gastrointestinal tract does not elicit much enthusiasm from a surgical viewpoint. However, when a gastric diverticulum is demonstrated, the rarity of this lesion captivates the interest of all. Literary studies definitely categorize gastric diverticula among the rarities in surgery. This entity has a reported incidence ranging from 0.001 per cent to 0.5 per cent. These figures are based upon roentgenologic and gastroscopic studies as well as surgical and necropsy specimens.[1,7,8,9,10] Thus it is an unusual experience to encounter many of these diverticula during the professional life of any one surgeon.

Gastric diverticula are sac-like evaginations of the wall. The cavity is continuous with the stomach by an orifice or neck-like formation. Basically diverticula may be congenital or acquired. The walls of congenital diverticula are full thickness corresponding to those of the stomach. In the acquired type, diverticula may be lacking in some gastric layers. Diverticula may be classified as follows: (1) congenital diverticula, (2) acquired diverticula and (3) pseudodiverticula.

Etiology. Congenital diverticula find their origin in embryonic life. The exact mechanism of origin is questionable. According to some authors an atavistic phenomenon associated with pancreatic development has been incriminated.[2] Others believe that diverticula near the pylorous especially are due to dispersed pancreatic anlages.[1] Suffice it to state that congenital diverticula result from malformation or disturbance in development. All gastric layers are present. Congenital diverticula are round, smooth cul-de-sacs, usually with a wide neck.

Acquired diverticula offer opportunity for speculation as to their origin. The walls of acquired diverticula consist of a mucosa, submucosa, varying numbers of muscular fibers and a serosa. They may be derived from hernial formations of the mucosa across vascular orifices.[4] The passage of the mucosa through existing vascular orifices in a weakened wall may be caused by an increased intragastric pressure during the process of digestion. Another etiologic factor may be a circumscribed paresis of the gastric wall.[2] This paresis is assumed to result from a chronic neuritis of a branch of the vagus nerve. Factors closely resembling those producing an esophageal diverticulum may be considered. Especially is this true in diverticula near the cardia. At this site the longitudinal muscles of the stomach divide into two muscular fasciculi. Within the region of the division the muscularis is formed only of circular muscle fibers.[10] This is a weakened area which is the basis for the development of a diverticulum. This class of diverticula have narrow orifices.

Pseudodiverticular formations may be formed by pathologic conditions producing a pouching of the stomach walls. The most common of these causes are perigastric adhesions, ulcers and other inflammatory lesions. (Fig. 1.)

Gastric diverticula are usually seen in men. The location of choice apparently is the lesser curvature, at the cardiac end of the posterior wall. However, there is no reason to doubt the possibility that a diverticulum may occur elsewhere. Since the localization at the cardiac orifice is most common, at times it has been termed the "cardiac orifice diverticulum."

Pathology. Gastric diverticula may assume various shapes and sizes. The orifices may be large or small with or without a pedicle simulating a neck-like appearance. This pedicle enters the diverticulum. The

diverticulum itself is a pouch-like projection. The diameter of the sac may range from 1 by 2 cm. to 5 by 6 cm.[5] The diverticulum is lined with gastric mucosa. Its wall, however, is thinner than normal stomach.

Histologic section demonstrates gastric diverticula to consist of mucosa, submucosa, muscle fibers and serosa. The wall, however, is composed of compressed glandular elements with flattened epithelial cells which may be only one layer thick. Beneath these cells is seen a layer of lymphoid tissue. The muscular elements are an attenuated layer of poorly developed muscle bundles. Outside this may be seen a little connective tissue and a serosal covering.

Associated gastric disease has been reported in proven cases of diverticula.[5,8,9] The combination of diverticulum and ulcer has been stressed; however, many diverticula are not associated with ulceration. Consequently, while the symptoms of uncomplicated gastric diverticula are often suggestive of peptic ulcer, it must not be forgotten that an ulcer may be associated with a diverticulum.[5] Neoplasms have been encountered in diverticula. Adenomyoma, fibrosarcoma, sarcoma, cancer and precancerous lesions have been recorded as present in gastric diverticula.[9] This underlying condition often causes the symptoms which are attributed to the diverticulum. Thus the true nature of the lesion is determined only at operation or necropsy.

Clinical Picture. A definite clinical pattern cannot be postulated for gastric diverticulum. In truth, many patients with uncomplicated diverticula are asymptomatic. When symptoms do occur, they are not manifested until the fourth or fifth decade of life. A logical assumption is that diverticula with narrow necks are more likely to cause symptoms because of difficulties in emptying. Associated disease in diverticula or pseudodiverticula usually produce clinical symptoms.

Because this lesion is located in the stomach, the manifestations of a diverticulum may produce any symptom generally associated with gastric disturbance. The most common symptoms are: (1) Pain, epigastric or upper abdominal; dull aching or burning in type; may or may not be relieved by food; (2) vomiting; (3) belching; (4) epigastric tenderness, slight to moderate; (5) dysphagia when lesion is large and near esophagus; (6) bleeding; hematochezia, hematemesis are rarely present, but may occur; and (7) the sensation of pressure and a feeling of gastric distention associated with hematemesis has been reported.[1]

In summation, the clinical picture depends upon the site and size of the diverticulum and the presence of ulceration or food retention within the sac. The usual biochemical studies including gastric analysis rarely assist in the diagnosis of uncomplicated gastric diverticulum.

Diagnosis. Since the clinical picture is not characteristic, the roentgenologist often makes the diagnosis. Even he may find difficulty in interpreting the finding. The diverticulum may be missed if studies are made only in the postero-anterior position. Because of this fact studies in the erect, prone, oblique and lateral positions have been recommended.[1] Hence it can be appreciated that the diagnosis of a true gastric diverticulum is impossible without the aid of *x*-ray. At times roentgenologic diagnosis is extremely difficult. For this reason the following three postulates must be fulfilled in arriving at a roentgenologic diagnosis of gastric diverticulum:[7] (1) The sac must be mobile and unattached to extragastric structures; (2) the shadow must be well defined, smooth, regular and demonstrated from various angles; (3) usually no tenderness is elicited over the area of filling.

Gastroscopy has limited value as a diagnostic aid because of the location of diverticula in an area which cannot be visualized. When the lesion can be seen with a gastroscope, it closely resembles a bladder diverticulum. It has a round, sharp orifice; the diameter of the opening is

Fig. 1. Roentgenogram of a pseudodiverticulum in a fifty-five year old man with a perforating gastric ulcer found at operation.

smaller than the greatest diameter of the diverticulum. If light can be reflected into the opening, it is seen to be covered with a smooth red mucosa. Normal rugae are discerned.[7]

Differential Diagnosis. Before concluding that a lesion is a diverticulum, other diseases in which destruction of the stomach wall occurs must be eliminated. The most confusing lesion to be differentiated is a penetrating gastric ulcer,—often called Haudek's niche. (Fig. 1.) This may be eliminated by the usual location of the diverticulum, the absence of contralateral spasm, infiltration and rigidity. Moreover the normal mucosal pattern can be demonstrated in a diverticulum but cannot in a gastric ulcer. The presence of an ulcer history and gastric analysis are valuable adjuncts in the differential diagnosis.

Diaphragmatic hernia occasionally is confused with a gastric diverticulum. Adequate x-ray studies will demonstrate the presence of a diaphragmatic hernia. The visualization of a gastric shadow in the chest with a gas bubble and fluid level is almost pathognomonic of diaphragmatic hernia.

Very often the diagnosis of gastric ulcer or carcinoma is made only at the time of operation or autopsy, even as the presence of a diverticulum is only revealed by these procedures. Our own experience with three cases of gastric diverticulum falls into this category.

Table 1
COMPOSITE CHART OF THREE CASES DISCUSSED

Case	Age	Sex	Gastric Symptoms	Cause of Death
I	52	M	None	Acute coronary occlusion
II	45	M	From Family 1. Epigastric pain 2. Nausea 3. Questionable hematemesis	Accidental death; brain laceration
III	62	M	None	Congestive heart failure

CASE REPORTS

We have seen many instances of diverticula demonstrated by x-ray. At operation the underlying lesion was an ulcer forming a pseudodiverticulum. However, three cases of true uncomplicated gastric diverticula were seen at autopsy in adult men who died of causes not related to the gastric findings. Table 1 and Figure 2 illustrate the salient features of these cases as well as a diagrammatic picture of the diverticula.

These three cases presented features which comply with the pattern of simple, uncomplicated gastric diverticula as previously discussed.

Complications. Subsequent to the accumulation of undigested food in a diverticulum, decomposition occurs which is a factor in the development of inflammatory changes. Edema of the mucosa accompanying the inflammation may produce stenosis of the diverticular neck. Thus a vicious cycle is established which further increases fermentation and accompanying inflammation. The development of com-

plications may be explained in this way. Hence gangrene and inflammation of the serosal surface may occur. This may lead to erosion of a blood vessel and fatal hemorrhage. Diverticula must be considered as a cause for idopathic sepsis.

is the high incidence of associated disease in diverticula.

In the presence of active gastric symptoms, surgery is necessary when, after an adequate medical regimen, symptoms persist. Diet may alleviate symptoms somewhat but

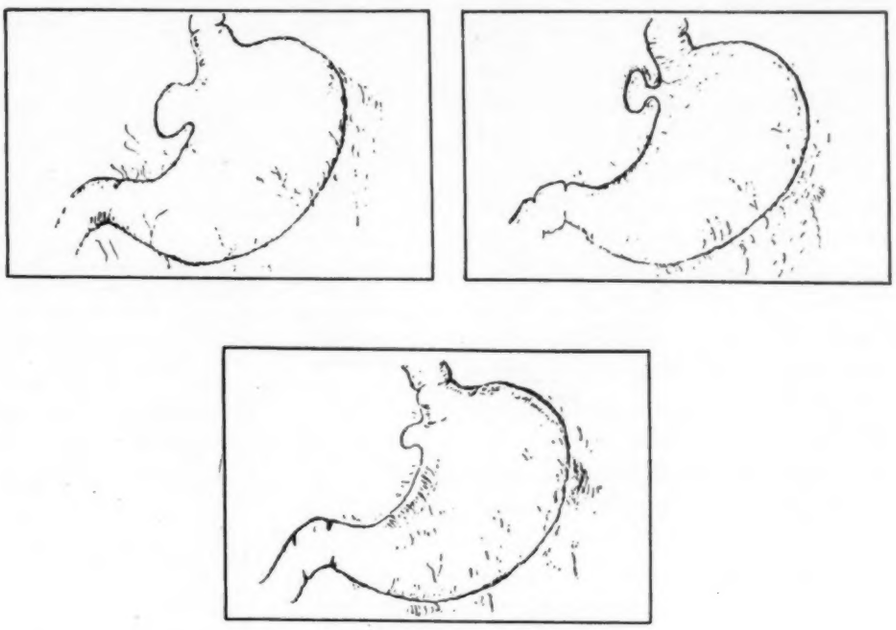

Fig. 2. Cases I, II and III.

A high incidence of associated disease has been reported in gastric diverticula. Benign and malignant tumors have been recorded such as leiomyosarcoma, adenomyoma, fibrosarcoma, sarcoma, carcinoma, adenoma and myoma.[7] Recurrent slight bleeding and massive hemorrhage have occurred. In addition to blood vessel erosion, bleeding has been attributed to stagnation of food particles, trauma from harsh food or the retention of a highly acid gastric content. Bleeding from a gastric ulcer contained within a diverticulum is often the first sign of a diverticulum.[7] Thus the combination of diverticulum and ulcer has been stressed.[5]

Treatment. Surgical treatment is indicated for gastric diverticulum because of the inherent tendency of irritative lesions of the stomach to become malignant. Whenever a suspicious lesion simulates cancer, surgery is imperative. Another factor stimulating surgical intervention rarely effects a cure. Usually patients are not relieved at all by a dietary regimen. When food is retained in the sac, medical treatment is ineffectual. Ulceration, bleeding and perforation have occurred while patients were on palliative treatment.[3] Some authors have advocated the surgical removal of gastric diverticula if symptoms are present.[7] The choice of treatment must be a matter of judgment, with surgical intervention advocated if the occasion demands it.

Surgical treatment consists in dissecting and liberating the sac similar to the procedure for esophageal diverticulum. The neck is then crushed, ligated and the operative site inverted.

Prognosis. Asymptomatic gastric diverticula without surgical treatment must be considered as having the same prognosis as bladder or esophageal diverticula. When symptoms occur the prognosis is altered because of the possibility of associated

diseases, especially ulcer and neoplasm. In the presence of these pathologic entities, the prognosis is the same as that for gastric ulcer and neoplasm. A diverticulum containing either ulcer or cancer may produce the same complications as these lesions without a diverticulum.

Surgical treatment of uncomplicated gastric diverticula alleviates the symptoms caused by it. Usually the mortality is very low; no serious sequelae or recurrences are anticipated following surgery.[3] When gastric resection is necessary for ulcer or malignancy, the prognosis is the same as for these lesions without a diverticulum.

SUMMARY AND CONCLUSIONS

1. The presence of gastric diverticula, according to the literature, must be listed as a rarity in surgery.

2. Etiologically this lesion may be congenital or acquired. Pseudodiverticula may be formed which are difficult to differentiate from true diverticula.

3. No definite clinical picture categorizes this entity. Diagnostic aids are x-ray and gastroscopy. Often asymptomatic diverticula are found at operation or autopsy.

4. The high incidence of associated benign and malignant conditions is stressed.

5. Treatment is based on judgment. However, in the presence of indecision, surgical intervention should not be denied the patient with symptoms.

6. Surgery is advocated because of the high incidence of associated lesions in gastric diverticula.

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INCISIONAL HERNIA REPAIRED WITH TANTALUM GAUZE*

PRELIMINARY REPORT

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ALTHOUGH a number of reports of successful repair of skull defects by tantalum plates have appeared in the literature,[1–3] we can find no references to the surgical employment of this metal in the form of gauze. It therefore seems justifiable to call attention to its value and to report a case in which the tantalum mesh was used with satisfaction.

Tantalum, the seventy-third element in the periodic table, was discovered by Ekeberg[4] in 1802, and was so named because he found it to be "tantalizing" when he attempted to dissolve it in mineral acids. It is manufactured in the form of sheet, foil, ribbon, wire, screws, plates and gauze or screen. Among its physical properties are its strength and malleability. It is ductile and may be drawn into fine wire which appears to be an excellent suture material. Burke,[5] in 1940, used it experimentally in animals and found it biologically inert. It was probably first used in human surgery by Fulcher[1] who employed it for the repair of skull defects. Later investigators have confirmed its value.[2–4] McNealy and Glassman[6] have recently reported satisfactory results with perforated Vitallium plates in the repair of hernia. Whether or not tantalum gauze will prove superior to the latter for this purpose remains to be seen, but its physical characteristics and the ease of its employment give promise that it may.

No surgeon prefers to substitute foreign material for human tissue, yet there definitely comes a time in the realm of reconstructive surgery when autogenous tissue does not seem to be the best answer, at least in the quantities desired and needed. The neurosurgeon has perhaps realized this more in his quest for ideal material in the repair of skull defects. Orthopedic surgeons are now finding less need for foreign substances as more is known about the advantages of bone grafts in replacing the use of metal plates. Generally speaking, plastic surgeons refrain from the use of foreign material. Perhaps this is due in part to the fact that their reconstructive needs usually are not great and that their work is most often located in parts of the body which do not lend themselves to foreign body substitution.

At one time the question as to whether or not incisional hernias belonged to the plastic or general surgeon was a matter of controversy. It is now generally conceded that such hernias belong within the realm of general surgery. However, in order to repair such defects the methods of plastic or reconstructive surgery must be employed.

No surgeon contemplates the repair of a massive incisional hernia with great enthusiasm, especially in the upper quadrants. The difficulty, and at times the impossibility of bringing together the supportive fascial tissues without tension or even with tension, puts such cases in the category of problem surgery. Various expedients have been tried to overcome the difficulty. Among these are fascial transplants, pedicled fascial flaps and cutis grafts. Since, as remarked by McNealy, the transplanted fascial flaps and folded fascial flaps are often no stronger than that at the hernial

* The use of tantalum gauze in surgery was called to our attention by Dr. L. R. Dragstedt.

* From the Department of Surgery, Provident Hospital, Chicago, Ill.

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Fig. 1. Front view of an upper abdominal incisional hernia which resulted from emergency surgery for a ruptured peptic ulcer one year previously.
Fig. 2. Lateral view of the same patient as Figure 1.

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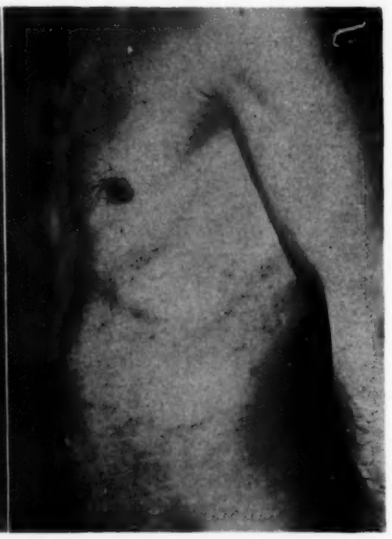

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Fig. 3. Four-week postoperative view after tantalum implantation. The hernia is obliterated.
Fig. 4. Lateral postoperative view four weeks after implantation of tantalum.

site, repair attempted with the use of this material may be foredoomed to failure. Cutis grafts have not proved generally successful. Moreover, they have the disadvantage of leaving unsightly scars at the donor site, a matter of considerable importance in certain classes of patients. Any substitute which provides solid support without undue complications is therefore welcome.

It would appear that tantalum screen or gauze at this time most nearly approaches the ideal in selected cases.[7] Tantalum gauze is not yet available for general distribution.* "To use this material in herniorrhaphy the secret seems to lie in the fact that a repair can be done without

* We were able to secure the material and a discussion of its use from the Ethicon Suture Laboratories, Division of Johnson & Johnson.

FIG. 5. X-ray shows tantalum in place in upper abdomen.

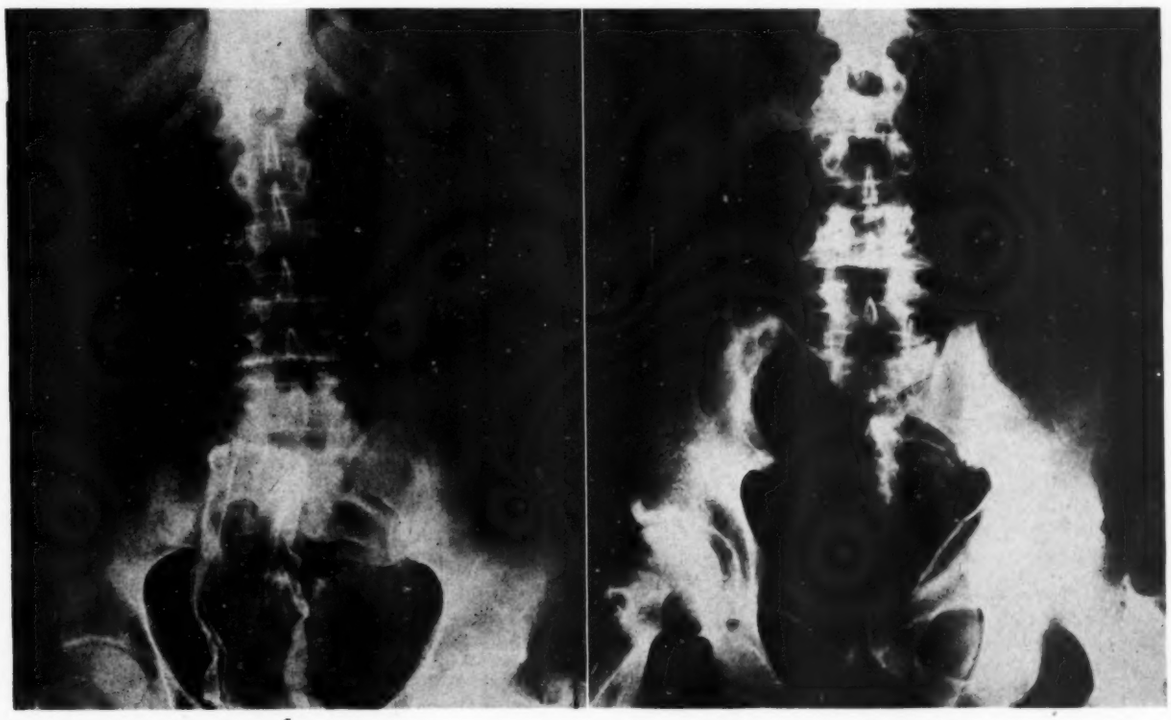

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FIG. 6. Lower midline incisional hernia following cesarean section. X-ray shows tantalum in place in lower mid-abdomen.

FIG. 7. Tantalum gauze was used in the repair of left inguinal hernia.

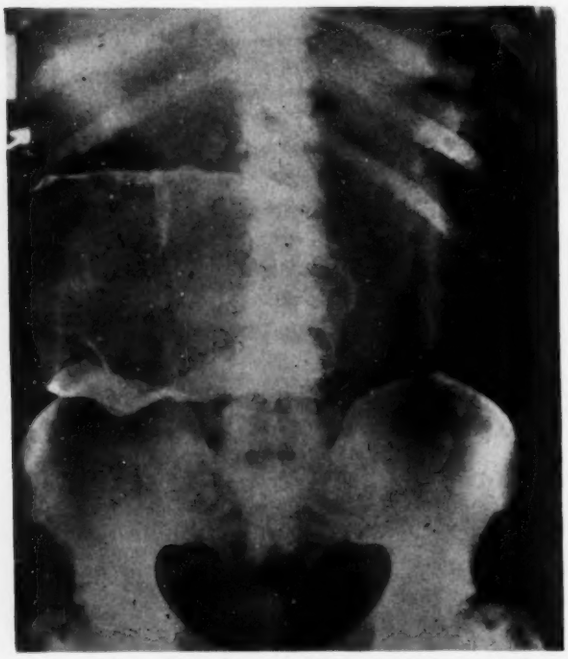

FIG. 8. X-ray flat plate of abdomen shows tantalum gauze well in place on the seventh postoperative day.

FIG. 9. Patient in standing position shows obliteration of hernial defect six weeks postoperativley.

tension on any of the supporting structures, that is using tantalum cloth or gauze as a patch to cover the hernial defect." Microscopically, it has been shown that the fibrous tissue encapsulates the gauze and becomes adherent to the surrounding fascia thus producing a new wall of fibrous tissue. Experimental observations after eight months showed that these results were obtained. So-called work hardening may allow the gauze to break but this does not appear to alter the strength of the hernial repair. (Figs. 1 to 7.)

Iason[8] concludes his chapter on incisional hernia, after presenting the various reparative technics, by saying, "In general, it may be stated that the prognosis is good in small hernias and poor in those in which constitutional diseases are prime factors."

A patient with incisional hernia was recently operated upon in whom the problem of widely separated edges was solved by the use of tantalum gauze.

CASE REPORT

L. A., a thirty-one year old male, was first admitted April 30, 1945, with a history and findings which would support a diagnostic impression of cholelithiasis. However, because of surgery for a ruptured appendix elsewhere several weeks previously, a diagnosis of right anterior subphrenic abscess was considered more likely. The patient was operated upon May 4, 1945, using an upper right quadrant transverse incision, through which an anterior subphrenic abscess was encountered and drained. During the postoperative convalescence he developed a severe cough with large amounts of purulent, foul-smelling sputum. A fistulous drainage through the right lung was considered and supported by x-ray findings. Improvement after chemotherapy and postural drainage was sufficient to warrant discharge from the hospital on May 25, 1945. A chronic cough persisted with small amounts of sputum. Subsequent x-ray studies suggested the presence of a residual subphrenic abscess. For this reason further surgical exploration was advised. The patient re-entered the hospital April 15, 1946, and was operated upon April 23, 1946, through a transverse incision over the twelfth rib which was removed. A residual abscess beneath the right diaphragm was encountered and drained. He was discharged May 14, 1946, much improved. At this time evidence of an oncoming incisional hernia was perceived. The patient wore a corset binder until November 14, 1946, when he acceded to advice for surgical repair.

Operation for the relief of the hernia was performed under spinal anesthesia November 25, 1946. The scar was excised and the skin and subcutaneous tissues were dissected until

fascial margins were encountered. The hernial defect measured about 6 by 8 inches, the widest dimension being transverse. The upper fascial border was found at the costal margin. The lateral border was along the latissimus dorsi. The medial border was at the midline and the inferior border had receded to halfway between the umbilicus and pubis. Fat, omentum and remnants of peritoneum presented in the defect. Enough tantalum gauze to cover the defect was fitted in a double layer. No attempt was made to pull the fascial margins together which would have been impossible. After covering the defect with the folded gauze its edges were everted and pressed down. The rolled edges of the gauze were sutured to the fascia with interrupted linen sutures. A few interrupted sutures of the same material fixed the peritoneal remnants to the gauze. The subcutaneous fat was closed with interrupted sutures of No. 1 chromic and the skin was closed with interrupted black silk sutures.

The immediate postoperative condition was without incident. The patient remained in bed for seven days at which time roentgenograms of the operative site revealed the radio-opaque gauze to be well in place. (Fig. 8.) The skin sutures were removed and the patient was discharged on the twelfth postoperative day with no complaints. A corset binder is being worn until it is thought that healing is sufficiently well established to support the defect. Brief examinations without the binder show the hernia to be obliterated. (Fig. 9.)

SUMMARY

Herein is presented a preliminary report on the use of tantalum gauze in the repair of a massive incisional hernia with good immediate results as well as x-ray pictures and photographs of three additional patients treated similarly.

It is far too early to draw conclusions, yet it would appear that this form of reconstructive repair deserves further study especially in those patients who do not lend themselves readily to other methods.

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USE OF APONEUROTIC FLAP IN INGUINAL HERNIOPLASTY

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A NEW method of inguinal hernioplasty modifying Beach's[1] aponeurotic flap was introduced by the author's service at the Sydenham Hospital, New York, N. Y.

FIG. 1. Aponeurotic flap formation by two vertical incisions 2½ inches long united by a transverse incision at their upper ends.

Beach believed that by his method he "was able to replace the inguinal canal by an exit thus putting a gravitational obstacle in the way of recurrence." We have found that this method of gravitation was insufficient and that a more effective repair can be accomplished by suturing the true border of the conjoined muscles to Poupart's ligament.

An inguinal incision 3 inches long is made. The upper angle is retracted to expose the external oblique aponeurosis in a wide area. A vertical incision 2½ inches long is made through the external oblique aponeurosis from the mesial margin of the internal ring. Another incision is made from the lateral margin of the external ring approximately 2½ inches long with a slight oblique deviation to the lateral side in order to avoid encroachment on the anterior rectus sheath. The upper ends of these incisions are united by a transverse incision. (Fig. 1.) This aponeurotic flap is retracted downward exposing the inguinal canal from above. The hernial sac is dissected from the cord, the highest point of its neck cleaned of surrounding tissue, transfixed and the sac removed. The aponeurotic flap is then passed beneath the cord. Poupart's ligament is swept clean of areolar tissue down to the tubercle of the pubic bone and the conjoined muscle border is sutured to its lower shelving edge by means of four or five interrupted chromic catgut sutures on an atraumatic

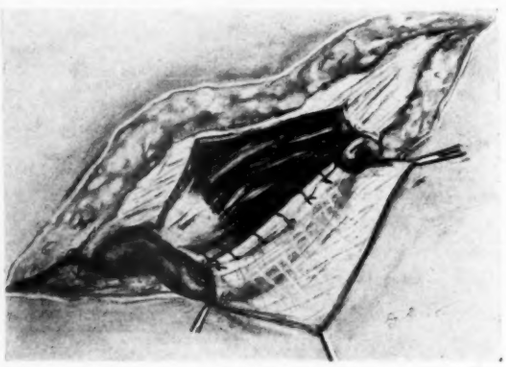

FIG. 2. Application of Bassini suture upon excision of the hernial sac. The cord is transplanted extra-aponeurotically.

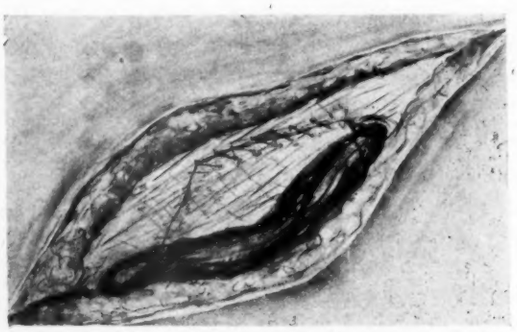

FIG. 3. Flap brought back to its former position and its cut edges approximated by a continuous catgut No. oo suture.

needle. The first suture is introduced through the periosteum of the spine of the os pubis and includes Gimbernat's ligament. (Fig. 2.) The flap is now brought back to its former position and its cut edges are approximated by a continuous chromic catgut No. 00 suture. (Fig. 3.) Two to three subcutaneous plain catgut sutures are introduced to obliterate the dead space. The skin edges are united by using Michel clips or fine silk.

COMMENTS

Since Lucas Championiere, in 1883, first exposed the inguinal canal by splitting the external oblique fascia directly over it, many forms of repair have been described thus indicating that no perfect method has yet been attained. In each procedure scar tissue forms directly over the inguinal canal predisposing to atrophy and loss of elasticity of the fascia and affording the possibility of recurrences. We have attempted a more physiological approach to the repair of inguinal hernia by means of the flap method. The incision of the fascia is made about 2½ inches from the canal and therefore no loss of elasticity or atrophy can be expected. At the present time seventeen operations have been performed. These cases consisted of two sliding hernias, four direct hernias, two inguinal scrotal, one direct-indirect and eight oblique hernias. In each case we have found that the flap method afforded excellent exposure permitting us to treat adequately all varieties of inguinal hernias.

Although Beach's flap method of operation may be adequate for young, strong individuals, we have utilized, in addition, the non-transplantation method of Coley-Ferguson; however, in cases of direct hernias, indirect hernias of long standing and wide-mouthed sliding hernias the flap method even with transplantation of the cord is insufficient to cure the hernia. In these cases the complete closure of the surgical triangle is obligatory. We have accomplished this by a Bassini suture and transplantation of the cord extra-aponeurotically.

Our results up to the present have been very encouraging. Postoperatively, the patients have a sense of well-being. Some have gotten out of bed on the second or third day and have been discharged on the seventh or eighth day.

SUMMARY*

1. A physiological approach to the repair of inguinal hernia has been described.

2. The method is simple and affords excellent exposure.

3. Hospitalization has been reduced from the usual ten to fourteen days to seven days.

The author wishes to thank Dr. Helmuth Nathan for his artistic drawings.

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* Since submission of this paper 36 additional patients were operated upon by the same method by Dr. Nathan and myself, all with the same good result. No recurrence was noticed up to date.

DIAGNOSIS OF ACUTE APPENDICITIS IN THE TROPICS

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Medical Corps, Army of the United States

THE onset of a number of diseases indigenous to the tropics is associated with abdominal signs and symptoms necessitating careful exclusion of acute appendicitis. For the surgeon whose judgment and experience as well as training are the product of a temperate climate the diagnosis of acute appendicitis under these circumstances presents a real challenge.

In a recent article Ravdin and Wolf[1] brought attention to the simultaneous occurrence of appendicitis and malaria as well as the difficulty encountered in interpreting abdominal signs and symptoms in patients with malaria and receiving antimalarial medication. Howe[2] has admirably discussed the problem in regard to amebiasis in his paper on the surgical aspect of intestinal amebiasis. During the past two years on the surgical service of a hospital operating in New Guinea and Luzon, P.I., we have encountered similar diagnostic difficulties in other tropical diseases as well.

While not exclusively confined to the tropics amebiasis is highly endemic in the Philippines. In the majority of cases encountered the possibility of appendicitis is not suggested although in cases with cramping abdominal pain, slight nausea and lower abdominal tenderness without diarrhea appendicitis must be excluded.

Recently a white male soldier was admitted complaining of nausea and lower right quadrant abdominal pain of twelve hours' duration. He had previously been in good health with no gastrointestinal complaints except for an attack two weeks previously of what he referred to as the "G.I.'s," an army term exclusively, which proved to be a bout of otherwise asymptomatic diarrhea which subsided completely in twenty-four hours. On examination significant findings were confined to marked lower right quadrant tenderness, rebound tenderness and muscle spasm. On rectal examination tenderness high on the right side of the pelvis was noted. A total leukocyte count of 16,500 with 82 per cent granulocytes and 18 per cent lymphocytes contributed to the provisional diagnosis of acute appendicitis. When the appendix was exposed and found to be normal in appearance the cecum was examined. The only lesion found was a granular appearing, hemorrhagic, acutely inflamed area 2½ cm. in diameter and sharply circumscribed on the lateral serosal surface of the cecum. The appendix was not removed and postoperatively active therapy for amebiasis was started. It was not until several weeks following operation that the diagnosis of amebiasis could be confirmed by the finding of endomoeba histolytica in the stool. Operation, in this instance, apparently did not alter the course of the disease.

Another case presented a similar syndrome of nausea, vomiting, and abdominal pain of sudden onset. Right lower abdominal tenderness, muscle spasm, tenderness on rectal examination and leukocytosis were found. The patient had had no history of diarrhea or other recent gastrointestinal symptoms. At operation a characteristic acute inflammatory process involving the appendix and the cecum for a distance of about 3 cm. from the base of the appendix was found. In this instance the appendix was removed because perforation appeared likely. Although active therapy for amebiasis was administered the patient subsequently developed a low grade hepatitis which prolonged convalescence for several weeks.

The explanation for the symptoms simulating appendicitis is not hard to find. In amebiasis the colon and occasionally the terminal ileum is invaded by the trophozoites of endomoeba histolytica. In some cases the cecum or, as noted above, even the appendix may be the site of the initial involvement. The primary lesion is a submucosal abscess which may go on to mucosal ulceration, thickening of the bowel wall and inflammation of the serosa.[3] In acute amebic typhilitis diarrhea may be

absent and the syndrome produced by such a localized lesion may be differentiated with difficulty from appendicitis due to other causes. Fortunately, in most cases diarrhea or more generalized findings are present. Trophozoites or amebic cysts may be found in the stool and when the rectum or sigmoid is involved characteristic proctoscopic findings are present.

"Dengue is an acute infectious disease caused by a filterable virus and transmitted to man by species of aedes mosquitoes."[4] Dengue and a large group of dengue-like fevers are endemic in the tropical islands of the Pacific. Generally, the diagnosis is easily made from the acute onset of the characteristic post-orbital pain, general malaise, joint pains and fever followed shortly by a morbilliform rash. Leukopenia is an outstanding finding and is helpful in making a diagnosis. Occasionally mild or atypical cases of dengue are encountered in which the onset and subsequent course of the disease lacks many of the diagnostic features. Mild abdominal soreness and tenderness associated with slight nausea frequently accompany the disease. Several patients with dengue in which abdominal soreness was the outstanding initial feature have been admitted to the surgical service. From these patients a history of onset several hours previously of slight general malaise, nausea, occasional vomiting and pain in the lower abdomen was obtained. In two instances tenderness and voluntary spasm in the right lower quadrant of the abdomen was of sufficient prominence to direct attention to the possibility of subacute appendicitis. In one instance right-sided tenderness on rectal examination was noted. In the absence of other signs the low initial leukocyte count with a relative lymphocytosis led us to defer operation. The onset several hours later of fever, generalized aching, severe headache and a few days later of a characteristic rash confirmed the diagnosis of dengue.

Although little is known of the pathology of uncomplicated dengue, a few petechial hemorrhages in the gastrointestinal tract and enlargement of the internal lymph nodes are mentioned by Stitt[5] as having been noted by other authors. Such findings could account for the signs noted in the cases mentioned.

Ancylostomiasis is widespread in the Philippines where it is usually due to infection by the helminth *necator americanus*. Considering the pathogenesis of the infection it can be expected that penetration of the mucosa of the small intestine by the worms will produce gastrointestinal disturbances. In patients encountered among the native population a recrudescence of hookworm infestation with abdominal pain and tenderness associated with nausea and vomiting has at times been confusing. The frequent necessity of obtaining a history through a lay interpreter coupled with a firm conviction on the part of the patient that he has appendicitis further complicates making a diagnosis. In spite of the fact that the duodenum and jejunum[6] are the site of the heaviest infection a number of instances have been encountered showing lower right-sided abdominal pain and tenderness with associated nausea. In such cases with a normal white count and relative eosinophilia operation has been deferred. The subsequent benign course of the disease and the finding of a hookworm ova in the stool have justified conservative therapy.

The large nematodes, including *ascaris lumbricoides*, *oxyuris vermicularis* and *trichuris trichuria*, are frequently found in the lumen of appendices removed in the tropics. In some cases acute appendicitis occurs as the direct result of their presence in the appendix. We have had two cases of acute suppurative appendicitis, one secondary to obstruction of lumen by a large ascaris worm, and the other due to the presence of a large number of oxyuris vermicularis. The mere presence of these worms in the bowel may give rise to ill defined abdominal symptoms which may be confused with appendicitis, but rather easily differentiated by examination of the stool for ova or worms. However, when the appendix

becomes obstructed or inflamed by these worms the resulting syndrome is not to be differentiated from appendicitis secondary to other causes.

In the tropics the constant presence of bacillary dysentery and multiple types of gastroenteritis is a cause of considerable concern to the conscientious medical officer. Occasionally the onset of diarrhea may direct attention away from the possibility of appendicitis only to have the persistence of symptoms and signs in the region of the appendix lead to operation. More often than not it will be found that the enteritis in the adjacent small bowel was responsible for the symptoms. However, a very acutely inflamed appendix was recently removed from a patient with an acute bacillary dystentery (Shigella paradysenteriae). Another patient was admitted with vomiting and diarrhea which had come on following a drinking bout. He ran a high fever, and passed fifteen to twenty blood-tinged stools daily. There was moderate leukocytosis. Treatment with sulfadiazine brought about little improvement in what was thought to be severe enterocolitis. Proctoscopic examination revealed only diffuse mucosal reddening. Stool examinations were not remarkable except for the presence of blood and pus. Ten days later a large left lower quadrant abscess was drained which subsequently was demonstrated to have been due to a ruptured appendix.

It is stated that the picture of subacute appendicitis occasionally develops in cases of schistosomiasis japonica.[7] In the early stages of the disease when the mature worms reach the intestinal tract and the females deposit eggs in the vessels of the intestinal wall, abdominal pain may be experienced. However, a history of exposure, the occurrence of fever, chills, urticaria, cough, generalized aching, leukocytosis with eosinophilia and the presence of ova in the stools should lead to the correct diagnosis. Schistosomiasis is not endemic on Luzon and we have had no direct experience with the disease in its acute phase.

SUMMARY

The presence of a number of tropical diseases new to the temperate climate surgeon stimulates interest in the differential diagnosis of appendicitis which too often is somewhat perfunctorily made. However, the principles of surgical judgment are no different in the tropics than any other place. The surgeon must familiarize himself with and also be prepared to recognize tropical disease which may simulate appendicitis.

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A TUNGSTEN STEEL GOUGE FOR USE IN A NICOLA OPERATION

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ANYONE who performs a Nicola procedure for recurrent dislocation of the shoulder realizes that technically a great difficulty is the proper placing of a drill hole so that it starts below the transverse ligament as it should and that it comes out at the center of the head. Another difficulty is in engaging the proximal end of the sectioned biceps tendon in a loop of wire, or whatever else may be used, in order to bring it down through this drill hole and suture it back to the distal portion of the long head of the biceps.

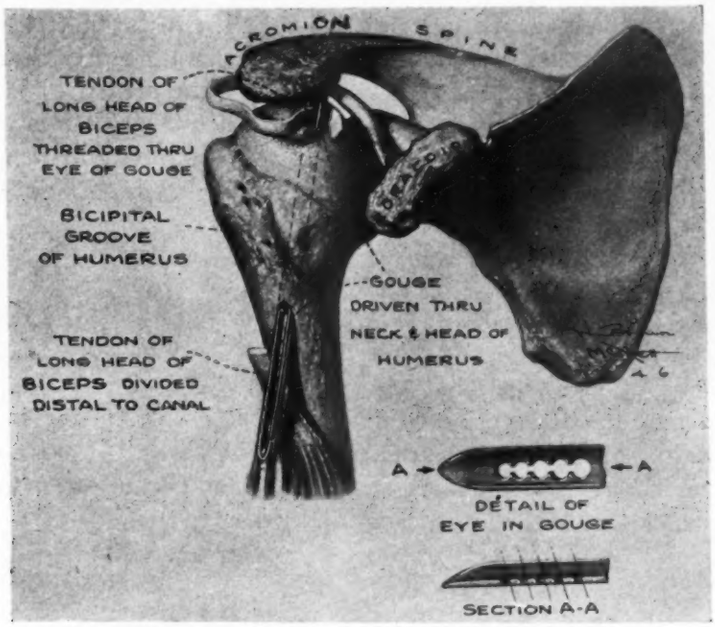
ACROMION
SPINE
TENDON OF LONG HEAD OF BICEPS THREADED THRU EYE OF GOUGE
BICIPITAL GROOVE OF HUMERUS
GOUGE DRIVEN THRU NECK & HEAD OF HUMERUS
TENDON OF LONG HEAD OF BICEPS DIVIDED DISTAL TO CANAL
A
A
DETAIL OF EYE IN GOUGE
SECTION A-A

FIG. 1. This illustration demonstrates the use of the gouge.

To simplify both of these details, it was believed that if a gouge along the lines of the one that Dr. Nicola used could be made, it would definitely aid in drilling the hole and controlling its position and point of emergence from the humeral head. For, if a long, sharp gouge is used it is easy to do the entire drilling and sight just the point on the head where the tip of the gouge should emerge. It was also believed that if in place of merely having an eye to thread a suture or wire through this gouge in order to pull the tendon down, holes might be so drilled that they would be oblique and in graduated size, the smallest at the tip and the largest toward the gouge handle. Then the tendon might merely be stuffed into the larger holes in the gouge and when the gouge is pulled down, the tendon would slide toward the smaller holes and be caught in the teeth-making of the edges of these continuous holes. The tendon would then come down with the gouge as it is withdrawn. It was realized that if the point of the gouge at this area was too thin it would shear the tendon, but it was believed that if it was thickened a little it would not injure the tendon in the least.

With this in mind a gouge such as has been described was constructed and to

obviate the possibility of breaking at the weakened point where so many drill holes were made it was felt that it would be best if it were made of a strong metal, such as tungsten steel. Such a gouge illustrated here was constructed and found to be very satisfactory. The technic is the introduction or gouge into the correct area in the region of the intertubercular groove and to drive it upward so that it will emerge at the center of the humeral head. Since the continuous connected holes are a little bit back of the point of the gouge, the point is merely continued upward into the acromion process and is partially buried in that structure. (Fig. 1.)

This then brings the slotted area of the gouge into clear view and accessibility, and it becomes a simple matter to take hold of the tendon end with a small hemostat and stuff its flat side into the long length of the drill holes until the tendon is stuffed through these holes. The gouge is merely withdrawn and since the larger holes are below the smaller holes, which are in turn at the tip or distal end of the instrument, the tendon merely rides up and engages upon the smallest holes and is tightly held so that it can be pulled through the entire drilled area with great ease.

The gouge measures ¼ inch in diameter and such a drill hole is adequate to bring the biceps tendon through the drill hole.

Correction: In our January, 1948 issue, on pages 234 and 235, in Figures 1 to 5, the author wishes to call attention to the fact that "After Holtfreter" should have been inserted under Figures 1 to 4 and Figure 5 to indicate the the original author of the illustrations.

VASCULAR OBSTRUCTED ACUTE GALLBLADDER

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IT is now almost generally agreed that the chronic condition of the gallbladder without stones had best be left alone surgically unless it is quite evidently a focus of infection or symptoms are severe and persistent. Conversely, all stones in the biliary tract are surgical problems even if they do not produce symptoms, since a high percentage of stones eventually cause serious complications.

That a cholecystectomy when possible is indicated rather than cholecystostomy, most all will agree. It is also agreed that when gallbladder surgery is being performed, if there is any possibility of their being a common duct stone present the common duct should be opened, probed, washed with saline and drained with a T tube. As yet no satisfactory way has been devised to deal with stones in the bile radicles in the liver itself; neither has an entirely satisfactory plan been devised for handling all patients with acute cholecystitis and lithiasis. Some have believed that all patients with cholecystitis and lithiasis should be operated upon as soon as possible. Others believe that the condition should be allowed to progress for several weeks and then an operation attempted. In some clinics and on some surgical services, rules have been promulgated to the effect that if an acute condition of the gallbladder is seen in the first thirty-six or forty-eight hours or sooner, the patient should be operated upon at once; if he is seen later, then he should be treated expectantly until a more appropriate time for surgery occurs. The reasoning behind this rule is that before forty-eight hours have elapsed the edema and inflammation is not sufficient to make handling of the ducts treacherous but that later than that it becomes so.

To the author none of the previous mentioned plans for acute conditions seem either satisfactory or based upon the pathological disturbance involved. In addition to the obstruction of the bile flow by stone, the important pathological condition which occurs and is frequently not even considered, is the vascular obstruction of the cystic vessels, either the vein or artery or both. This is, as a rule, due to the impaction of a medium size or large stone in the cystic duct. A condition results which is not dissimilar to that which occurs in an extremity when its main vessels are obstructed, namely, gangrene. Lesser degrees of vascular interference may cause a lesser degree of damage but with damaged tisssues infection readily sets in. Experimental infection of the gallbladder does not cause a pathological condition comparable to the above type of case.

That obstruction of the cystic duct or common duct alone causes no inflammatory or destructive action of the gallbladder wall, has been experimentally shown and is also clinically evident in patients with hydrops of the gallbladder as well as by the appearance of the gallbladder in those patients with carcinoma obstructing the common duct.

Infection quickly follows vascular involvement or sufficient local trauma in the gallbladder. The gallbladder of animals becomes infected by injecting bacteria into the wall of the gallbladder or by obstructing the common duct and injecting an organism into the gallbladder, although these do not proceed to rupture nor does gangrene develop. Of those clinical patients that have a ruptured gallbladder, gangrene, empyema, subdiaphragmatic or liver abscess as well as other severe and highly morbid states, most all had in the early stage a vascular obstruction due to the impaction of a stone.

In view of these observations it is obvious that to leave such a group of vascular obstructed gallbladder patients to "quiet down" is impossible. On the other hand to operate on patients with acute conditions who do not have vascular obstruction, after the forty-eight-hour period has passed, unnecessarily increases the risk and technical difficulty for these conditions will quiet down in time.

How then to determine which patients have a vascular obstruction? It is obvious that such patients must be operated upon as soon as hydration has been accomplished, even if an admittedly inferior operative procedure such as cholecystostomy has to be performed.

In the author's experience the persistence of pain is the predominating factor in differentiating these patients from those with simple colic or acute inflammation of a non-vascular obstructing nature. In addition, the early rise and continued height of the sedimentation rate is noteworthy. In the presence of persisting right upper quadrant pain, with a high sedimentation rate, the presence of a palpable, enlarged and tender gallbladder is further evidence of this condition.

If this conception of vascular obstruction of the gallbladder is kept in mind it will help us to recognize these pathological conditions early, so that the patients may then be operated upon early before other complications supervene.

SUMMARY

1. Patients with gallbladder disease plus vascular obstruction must be diagnosed early and operated upon as soon as possible.

2. Other patients with acute gallbladder pathological conditions should be allowed to quiet down before surgery, if seen forty-eight hours after the onset of symptoms; otherwise they should be operated upon at once.

3. The condition of the patients in the first group may be diagnosed by the persistent pain and increased sedimentation rate which is sometimes accompanied by a palpable, enlarged and tender gallbladder.

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Case Reports

TUMORS OF THE ADRENAL CORTEX

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THE adrenal gland has two component parts which are developmentally, histologically and functionally entirely unrelated.[1] Their importance in the scheme of life is shown by the fact that they have a more abundant blood supply than any other organ in the human body. It is interesting to note that the blood supply to the cortex and the medulla, which are totally unrelated in function, is the same.

Embryologically, the cortex is derived from the mesoderm and therefore is likey to form adenomas and adenocarcinomas. The medulla is derived from the same portion of the entoderm as the sympathetic ganglia and is therefore more liable to develop neuroblastomas, gangliomas and chromafinomas (phenochromocytomas).[2] In this paper aberrations of the cortex of the adrenal glands will be considered.

The secretions of the cortex are so numerous, the steroid hormones alone numbering twenty-five, that only a few of the more common secretions will be discussed. Desoxycorticosterone causes a marked retention of sodium chloride and water, increases the urinary excretion of potasium and phosphorous and causes elevation of the blood pressure. The hormones which affect carbohydrate metabolism are corticosterone, dehydroxycorticosterone and 17-hydroxy 11 dehydroxycorticosterone. The latter[3] is also known as compound E of Kendall or compound F of Pfiffner and Wintersteiner. It is also known that the adrenal cortex controls the excretion by the urine of the 17-ketosteroids (the androgen equivalent) and is responsible for the origination of the beta fraction.

Taken as a whole, the physiology of the adrenal cortex is concerned with: (1) electrolyte metabolism, (2) carbohydrate metabolism, (3) renal function, (4) growth of young animals, (5) resistance to stress and infection, (6) regulation of blood pressure, (7) muscular response, (8) sexual development, (9) vitamin C storage and metabolism and (10) lactation.

That there is an inter-relationship with all the glands of the body is clearly shown by the fact that diseases or tumors of the pituitary, ovary, thymus, pineal body and adrenal cortex may all give rise to identical clinical entities. These conditions are listed as follows:[3] (1) Tumors of the adrenal cortex. (2) hyperplasia of the adrenal cortex; (3) fuchsinophilic granules of the cells of the adrenal cortex; (4) basophil adenomas of the anterior lobe of the pituitary; (5) hyaline degeneration of the basophil cells of the anterior lobe of the pituitary; (6) sarcomatous and undifferentiated tumors of the anterior lobe of the pituitary; (7) arrhenoblastoma of the ovaries; (8) granulosa cell tumors of the ovaries; (10) Morgagni-Morel syndrome (osteitis frontalis interna); (11) tumors of the pineal body; (12) tumors of the thymus and (13) the classical picture is not infrequently observed in patients in whom no gross or microscopic abnormalities of any of the endocrine glands can be determined.

Any of the above conditions may give rise to three separate groups of symptoms

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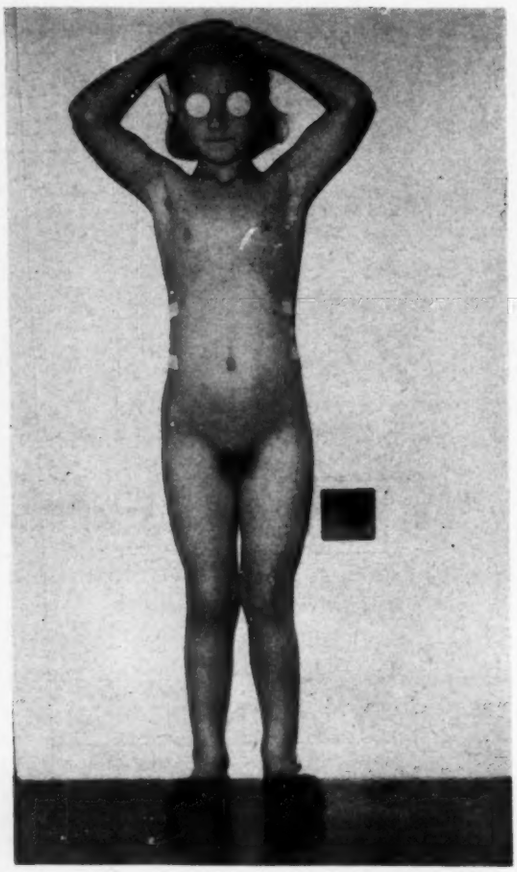


FIG. 1. General appearance of a girl of six years in Case 1.

which manifest themselves as follows: *First*, the production of premature sexual and physical development in children. *Second*, in adults an increased or decreased virility or alteration of sex characteristics. *Third*, the symptoms of obesity, hypertension, glycosuria, osteoporesis and cutaneous striations, which are called Cushing's syndrome. In the differential diagnosis of any one of these three symptom complexes, all but one of the various causative agents as listed above must be eliminated before establishing treatment.

In this paper three case histories will be presented which represent (1) hyperplasia, (2) adenoma and (3) adenocarcinoma. These three cases also illustrate each one of the three different clinical syndromes previously described.

The first case demonstrates how simple hyperplasia of the adrenal cortex may produce premature sexual and physical development in children with occasional alteration of secondary sex characteristics.

FIG. 2. Typical female escutcheon found in Case 1.

CASE REPORTS

CASE 1. S. S. (No. 2069, 2563, 3654, 3793.) The patient, a six year old, white dependent, was referred to the U. S. Naval Dispensary Pediatric and Gynecologic Departments by her school physician because of exhibitionistic tendencies. The physician discovered that this child, a muscular, unusually strong, boyish-girl, with a deep voice, who displayed impulsive, irregular sex behavior, was a possible pseudohermaphrodite. The clitoris was noted to be the size of a ten year old boy's penis and there was considerable pubic and some axillary hair. (Fig. 1.)

The girl was admitted to the U. S. Naval Hospital for study. She was found to be a sturdy, athletic child, active and alert under height for her age but not obese. There were no gross abnormalities of the skin, extremities or skeletal systems. The thyroid, heart and lungs were normal. There were no signs of breast development but axillary hair had appeared. The abdomen was also negative for masses, tenderness, etc., but there was well defined female escutcheon at the pubis. (Fig. 2.) The clitoris was noted to be 3.5 cm. long and 2.5 cm. at the base with a well formed glans resembling an hypospadiac phalus. Examination under ether anesthesia confirmed the presence of a normally deep vagina behind a snug hymeneal ring. The urethra was normal and a small cervix, uterus and normal ovaries were palpated. There were no masses in the pelvis.

Laboratory and other studies included the

following reports: I.Q. 99., basal metabolism minus 13 (satisfactory). Bleeding and clotting times 3½ minutes each; hemoglobin 91 per cent (Haden); red blood cells, 4.65 million; white blood cells 5,450, with 54 per cent polymorphonuclears, 41 per cent lymphocytes, 4 per cent monocytes and 1 per cent eosinophiles. These essential blood elements were always repeatedly similar to this report. The urine was invariably negative for sugar, albumin and the microscopic findings were not remarkable. The urine assay for the 17-ketosteroids was reported as 24 mg./24 hours (normal 4-6). X-rays of the wrists, etc., for bone age were reported as, "Characteristic of at least 10 years as compared with a chronological age of 6 years." Intravenous pyelograms, in the supine and erect positions, were, "Normal without evidence of pressure or mass at either upper kidney pole." Roentgenography of the skull and sella turcica was not remarkable. The pineal gland was not calcified or delineated.

The past history included a normal birth and no neonatal complications. Rubella, epidemic parotitis and tonsillitis were the only significant infectious diseases. There had been no operations or injuries. The child had always been bright and active.

The family history was significant only for hypothyroidism without goiter in the maternal grandmother and mother. Both had taken thyroid with benefit. There was one older sibling, a girl of ten years who was quite normal and feminine.

Diagnosis: Adrenogenitalism with pseudohermaphrodism (or pubertas precox.)

A bilateral exploration of the adrenals was affected under cyclopropane anesthesia with good exposure of both glands. The right was average in size and appearance. A liberal biopsy was obtained. The left was larger than the right and displayed a nodular, lobulated appearance with what the pathologist termed a mild degree of hyperplasia. No tumor was felt or seen on section of the glands. Approximately one-third of this adrenal was removed for pathologic study and whatever therapeutic benefit might acrue.

The patient was supported while under surgery although she slipped into mild shock. She responded well to therapy without eschatin which was kept in readiness. A moderately severe adynamic ileus postoperatively was combatted successfully with oxygen, parasympathetic stimulants, Wangensteen suction and enemas. The patient recovered despite rather extreme respiratory distress which was abdominal and bronchitic in origin, roentgenography of the chest revealing no pneumothorax, fluid, pneumonia, etc. There were three days of low-grade fever. The incisions healed *per primum* and she was discharged as recovered on the eleventh postoperative day.

Fig. 3. Greatly hypertrophied clitoris in Case 1.

The child was readmitted to the Hospital after four months' observation during which time no change in the voice, habitus, clitoris or behavior were noted. An excision of the clitoris was accomplished under cyclopropane anesthesia. She was discharged after nine days' hospitalization; the incision healed by first intention and with a good cosmetic result.

The pathological report revealed: "Normal appearing adrenal tissue. The zona glomerulosa cells contain a normal amount of lipoid material. The zona fasciculata and zona reticularis show no pathology. The left adrenal presents a similar picture to the right with no evidence of pathology. Impression: 'Normal Adrenals.'

"The clitoris measuring 3.5 x 2.5 cm. (glans 1.4 x 1.2 cm.) is obviously enlarged with hypertrophy of the smooth muscle elements within the muscular wall." (Fig. 3.)

The follow-up one year after adrenal explora-

4 5

FIGS. 4 and 5. Case II prior to surgery demonstrating the distribution of fat and hair.

tion revealed slight growth of the child in stature. She was still agressive, athletic and muscular, with a boyish trend. An even more profuse pubertal hair pattern had developed. The site of the clitoris was normal. An essentially male psyche persisted but there was definitely less overt behavior, aberration and exhibitionism.

The second case of adenoma in a young woman demonstrates the second group of symptoms in which there is alteration of the secondary sex characteristics in adults.

CASE II. I. L., age twenty-six, was admitted to the hospital in February, 1945, complaining of amenorrhea of three years' duration. The onset of menses was twelve years; she had a regular twenty-eight-day cycle, of two to three days' duration with dysmenorrhea. She had an appendectomy in 1940, at which time a small ovarian cyst was ruptured but not removed. Following this the interval between menstrual periods became progressively longer and finally in November, 1942, menses ceased entirely. There had been no vasomotor changes, no headaches and no change in weight but there was slight blurring of vision which was not constant. There was no nocturia, polyuria or change in appetite. About June, 1943, she noticed that hair was growing on her face, breasts, abdomen and legs. This became progressively worse until she had to shave her face once or twice daily and chest and legs weekly. There was also a gradual deepening of the pitch of her voice.

She had been adopted in infancy and knew nothing of her family, although there were several brothers and sisters. She had uncomplicated mumps, chicken pox and pertussis in childhood. Tonsillectomy was performed in 1928 and appendectomy in 1940.

This young woman, 5 feet 1 inch tall, weighed 120 pounds; temperature 98°F., pulse, 20, blood pressure 120/90. (Figs. 4 and 5.) The pupils were round and regular; fundi and discs were normal; the tonsils were surgically absent; the thyroid gland was not enlarged. There was coarse hair on the face, chest, breasts, thighs and abdomen of a masculine distribution. There was evidence of recent shaving of the upper chest and face.

The chest was symmetrical with breasts fairly full and well rounded. The heart and lungs were normal. The abdomen revealed no masses or tenderness. There was a long right rectus incision from a former appendectomy.

The genitalia were normal except for an enlarged clitoris. The hymen would not admit the examining finger. The consultant in gynecology made an examination under anesthesia which was negative for tumor and which showed the presence of normal tubes, ovaries and uterus. Currettings obtained at the same time showed only mucoid material. The neurologic examination was negative. Laboratory findings: Kahn—negative; several specimens of urine negative, red blood count 4,250,000, hemoglobin 80 per cent white blood count 5,600 segments 55, lymphocytes 32, bands 3. A glucose tolerance test using 50 Gm. of glucose revealed a flat curve reaching a high of 111 mg. per 100 cc. and low of 83 mg. with no sugar appearing in the urine. Further laboratory examination revealed blood calcium, 9.3 mg. per cent, blood phosphorous, 5.4 mg. per cent, blood chlorides 627 mg. per cent. The basal metabolism was plus 3; an electrocardiogram was normal. A forty-eight-hour specimen of urine was examined and showed 93.8 mg. of total 17 ketosterones (androsterone equivalent) per 24 specimen. (Normal in the adult female is 8 to 13 mg per twenty-four-hour specimen); estrogen twenty-four-hour, 25 units. (Normal 16 to 20.) A salt tolerance test made by giving 10 gm. sodium chloride in 1,000 cc. of water and testing the urine hourly showed normal excretion.

X-rays of the sella turica and chest were negative. Intravenous pyelogram and stereoscopic studies of the kidney and lumbar area showed a negative urinary tract with a somewhat oval shadow about 6 by 5 cm. immediately above and overlapping the pole of the right kidney, suggestive of a tumor mass in the right adrenal area. A perirenal insufflation test was not done.

She was operated upon May 14, 1945, under continuous spinal anesthesia plus sodium pentothal intravenously as an adjunct. The left side was entered first to determine the presence of a normal adrenal there. This is essential as death would ensue if the adrenal were to be removed from one side with a congenital absence or inadequate gland on the other side. When the left adrenal was found to be present and normal, the right side was opened. The twelfth rib was resected and two tumors of the adrenal exposed. One was oval, 5 cm. in diameter, and the other 2½ cm. in diameter. They were loosely adherent to the diaphragm. The three vessels supplying them were ligated and the tumors removed. The wound was closed in layers with a small rubber tissue drain. She received 500 cc. of citrated blood during the operation and 1,000 cc. of 5 per cent glucose in saline.

The pathologic examination of the gross specimen showed two adjacent, encapsulated, soft, reddish-brown masses, one about 5 cm. in diameter and the other 2.5 by 2 by 2 cm. There were many irregularly shaped yellow foci in the capsules. The cut surfaces were soft, reddish and yellowish, and moist. There were a few hemorrhagic foci.

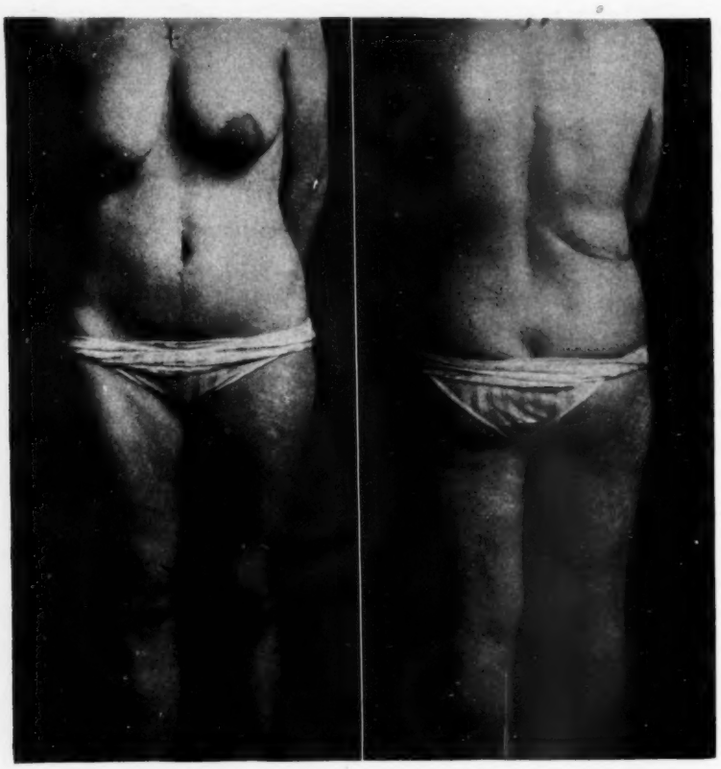
Microscopically, the tissue was composed of anastomosing cords and solid sheets of polyhedral cells resembling those of the zona fasciculata and reticularis of the adrenal cortex cytoplasm; others were granular. The nuclei tended to be central and round; and while there was some variation in size, the tendency was to uniformity. No mitoses were seen. There were scattered foci of hemorrhage but there was little pigmentation and no necrosis. Intravascular growths were not seen and there was little stroma.

Diagnosis: Adrenal adenoma; no histologic evidence of malignancy.

Postoperatively she received 1 cc. of eschatin every four hours. The blood pressure was taken every half hour with orders to give an extra cc. of eschatin each time it dropped below 80 systolic. This happened only once, on the first postoperative day, and during the first three days the systolic pressure ranged between 96 and 103 without rapid drops or rises. On the third day she had some distention which was controlled by enema and prostigmin. The highest rise in temperature was to 101°F., pulse 112, respiration 24 which rapidly subsided. Two days postoperatively the blood calcium was 9.7, phosphous 5.1, sugar 65.2 and the chlorides 627 mg.

On the seventh day the sutures were removed and the wounds healed except for a small draining area in the right side which subsequently healed well. Seven days postoperatively the blood calcium was 8.8 mg. blood chlorides 479.5 mg., phosphorous 3.9 mg. and the sugar 93.8 mg.

The urine was normal; red blood count 4,400,000; hemoglobin 77 per cent; white blood count 9,000; segments 66 and lymphocytes 34. On the twelfth postoperative day she



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Figs. 6 and 7. Case II fifteen months after surgery and three months after childbirth showing change in distribution of hair and fat.

developed a mild, superficial thrombophlebitis of the left leg which cleared up under penicillin treatment.

On July 12, 1945, a re-examination of the urinary output of hormones showed androgen 8.6 units compared with the 93.8 mg. preoperatively. (Normal 15 to 20 units.) The estrogen was also low showing 5 units with 12 to 16 units as normal. The hair on the face and breasts disappeared; pitch of voice became higher and, although there was no weight loss, the fat became redistributed so that the general appearance was different and she appeared quite feminine. The clitoris remained unchanged.

She returned to the East and married her childhood sweetheart from whom she had been estranged during her period of masculinity. A recent communication announced that she now is the mother of a normal baby girl. (Figs. 6 and 7.)

The third case, one of adenocarcinoma of the adrenal cortex, demonstrates that a very large tumor of the adrenal may give rise to a very few symptoms. The symptoms that are present fall into the classification of Cushing's syndrome.

Case III. Mr. G. F. age fifty-one, was admitted to the hospital July, 1946, complaining of vague indigestion and epigastric pain unrelated to meals. The pain was severe and accompanied by dizziness, sweating and rise in temperature to 102°F. He had tarry stools for about four weeks and, although he weighed 180 with a height of 5 feet 6 inches, claimed to have lost 20 pounds in two months. Sexual habits were unchanged.

Examination revealed a sthenic type of middle aged, obese male; temperature 99°F., pulse 80, respirations 20, blood pressure 110/75. All systems were normal except for tenderness over the epigastrium; an enlarged liver could be palpated four fingers below the costal margin. There was a questionable mass in the right side which could not be distinguished from the enlarged liver. X-ray examination of the gallbladder was negative. The gastrointestinal series showed a large diverticulum of the duodenum with some associated irritation in the descending duodenum. On flouroscopic exami-

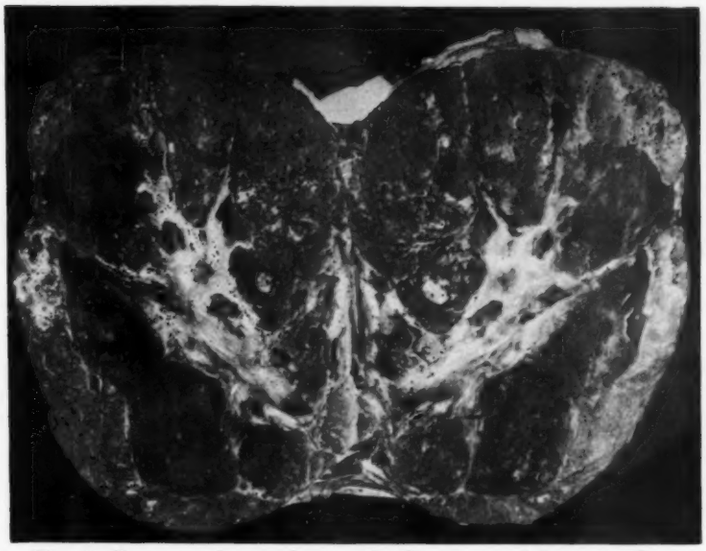

Fig. 8. Gross specimen of tumor in Case III; weight 1,539 Gm.

nation there was tenderness to pressure directly over this area. Laboratory examinations revealed red blood cells 4,000,000; hemoglobin 12 Gm. white blood cells 15,000; segments 64, lymphocytes 30, bands 5, eosinophiles 1; repeated urine examinations were negative; non-protein was 20 mg. per cent.

He was operated upon on August 18, 1946, through a right rectus incision for correction of the duodenal diverticulum. He was given spinal anesthesia consisting of 100 mg. novacain and 10 mg. of pontocaine. The diverticulum was closed by a series of purse-string sutures and the abdomen explored. The liver was smooth and uniformly enlarged. A soft mass was found between the right kidney, liver and the diaphragm measuring about 25 by 15 by 10 cm. The left adrenal was located and inspected to make sure it was present and the mass on the right removed. The blood vessels were very engorged and the branches from the phrenic vessels difficult to control. A fibrin foam pack was put against the diaphragm and held there by gauze packing and the abdomen closed. The gauze was removed gradually from the third to the fifth postoperative days.

During surgery he received 500 cc. of citrated blood and 1,000 cc. of 5 per cent glucose in saline. For the first three days he was given 1 cc. of eschatin every four hours as prophylaxis against shock from the removal of the adrenal. It is estimated that it takes about three days for the remaining adrenal to take over the function of both. His postoperative course was smooth except for some coughing. His blood pressures remained between 108/68 and 126/88. An x-ray survey of all his bones, which was made in search for metastases, was negative, as was also the chest x-ray.

The pathological report was as follows: gross: The specimen consisted of encapsulated ovaloid tumor mass measuring 18 by 14 by 14 cm. The tumor was soft in consistency and slightly lobulated. Cut section of one-half of the tumor showed the central area to contain a spongy-like, yellowish necrosis in center of which were several large blood vessels. Around the periphery was a layer 1 inch thick of somewhat softer, friable tissue of pinkish color. The tumor weighed 1,539 Gm. (Fig. 8.)

Microscopically, the sections revealed a rather varied picture. In some areas there was almost exact duplication of adrenal cortex. In these areas there were cords of alveoli masses of cells with abundant foamy, pink cytoplasm and vesicular round to oval nuclei. These masses were separated in general by a thin band of fibrous tissue. Some areas showed pseudopapillary arrangements with a central core of fibrous tissue resembling hypernephroma. In most of these areas the cells were regular and showed no marked anaplastic activity. In other portions, however, the aveolar and cord arrangement of cells was lost and there were broad sheets of diffuse cellular proliferation with little or no fibrous tissue stroma. Where the individual cells showed marked anaplasia and undifferentation, most of the cells were of large irregular hyperchromatic nuclei some of which were solid and some vesicular and there were

large sections of necrosis. The portion of the tumor of yellowish color seen in the gross represented necrotic tissue. This tumor in all probability represented malignant degeneration of a previously cysting adrenal cortaladenoma.

Diagnosis: Adenocarcinoma, adrenal.

The patient returned to his regular work one month after surgery and has been completely symptom-free for thirteen months.

COMMENTS

Case I. It would seem that Case I represents an instance of pubertas praecox, due to hyperplasia of the adrenal cortex, and is but one step beyond the "constitutional type" of sex precosity of the adrenal type. (In the constitutional type no abnormality, either gross or microscopic, is disclosed and the condition is considered due to hyperfunction. Unfortunately, resection of the adrenal gland alone does not appear to be a solution to the problem, nor is irradiation suited to these cases. The closest we can come at this time to remedial therapy in the pseudohermaphrodite group, following surgical diagnostic measures, is to remove the hypertrophic clitoris which would appear to be the focus for sex preoccupation and the site of interest in the exhibitionistic behavior.

The correct supervision of sexually precocious children is most important to prevent advances and indulgence by more mature members of the opposite sex and to avoid venereal disease. The risk of psychic trauma and even pregnancy in the more adult girls is obvious. The cooperation of the patient, patient's parents and physician is vital in this social-medical problem.

Case II. This case illustrates how all of the secondary sex characteristics can be altered by a relatively small tumor of the adrenal cortex. What is more important, however, is that these changes are all reversible (with the possible exception of regression in size of the clitoris) in a short time following surgical removal of the tumors and the patient can be restored to society as a normal individual capable of motherhood.

Case III. In contrast to Case II this tumor was enormous, but showed so few symptoms that it was a secondary condition which led the patient to seek medical care and to the discovery of the cortical tumor which was found to be malignant. Surgical extirpation was the only type of treatment to be considered.

SUMMARY

Three cases of adrenal cortical disease have been presented. These three demonstrate every variety of symptom complex which has sometimes been called the adreno-syndrome with the last case falling into the category of Cushing's syndrome.

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PRIMARY CARCINOMA OF BARTHOLIN'S GLAND*

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OF the malignancies of the female genital tract, carcinoma of the Bartholin or vulvovaginal gland is the one most seldom recorded. In this article I wish to add a case of ours and bring the number of recorded cases up-to-date.

CASE REPORT

Mrs. C. J., a widow aged sixty-four, was first seen by us on February 15, 1929. Items of importance in the past history were that she had six full term pregnancies and had two operations, a kidney stone was removed in 1923 and her gallbladder was drained in 1924. Her chief complaint on this first visit was that her periods, which had always been regular, had for the past nine months become irregular and profuse. A curettage was advised and this was done on February 23, 1929. The pathologic report disclosed endometrial hyperplasia. Following this curettage, her periods remained normal until March, 1930, at which time they stopped entirely.

The patient failed to return for check-up examination, as advised, and was not seen again until January, 1941, at which time she had a recurrence of vaginal bleeding. Another curettage was performed and adenocarcinoma of the endometrium was found. She was immediately given 3,000 mg. hours of intrauterine radiation and deep x-ray therapy; two weeks after completing x-ray therapy, a complete hysterectomy and bilateral salpingo-oophorectomy was done. Regular examinations since have revealed no evidence of recurrence of the endometrial carcinoma.

On April 25, 1944, the patient appeared with the complaint of vulvar itching of one months' duration. On examination a solid growth of the right vulvovaginal gland was found. The growth was roughly spherical and was about ½ inch in diameter. On the surface was a small ulcerated area. The whole mass was partially movable and, although it extended deeply, it was not fixed to the ramus of the pubic bone. There was no evidence of recurrence of the uterine carcinoma in the deep pelvic structures in the vagina. There was no evidence of involvement of the inguinal glands. The preoperative diagnosis was carcinoma of Bartholin's gland. Her previous pelvic check-up examination on November 22, 1943, had shown no evidence of trouble in the vulvar area. Figure 1 shows the gross and Figure 2 shows the microscopic evidence of the pathologic condition.

On May 8, 1944, a complete vulvectomy was done, care being taken to excise well beyond the infiltrated area of the growth. The patient was not a good operative risk and this, plus the fact that she evidently had a tendency toward carcinoma, we believed contraindicated the usual radical gland resection.

The patient was seen last on November 18, 1947, and there was no evidence of recurrence.

COMMENTS

The earliest reported case of carcinoma of Bartholin's gland was that of Kolb in 1864. Sixteen years later in 1880 Sinn recorded the second case. In the next thirteen years cases were recorded by Geist, Schweitzer and Mackenrodt. In 1906 Gaston Chaboux wrote an excellent thesis on carcinoma of Bartholin's gland and tabulated ten cases reported up to that time, including one of his own. Falls reviewed the literature up to 1923 and recorded a total of seventeen cases in table form. In 1930 Schneider brought the record up-to-date and found thirty-seven cases in all of proven primary Bartholin gland carcinoma. The next summary in table form was published by Simedinger in 1939; he collected thirty-eight cases. Some of those previously recorded by Schneider do not appear in his report. The most recent report in tabular form was made in 1944 by Aquinaga of Brazil. The recent reports of Boynton and Cosbie and some of the cases

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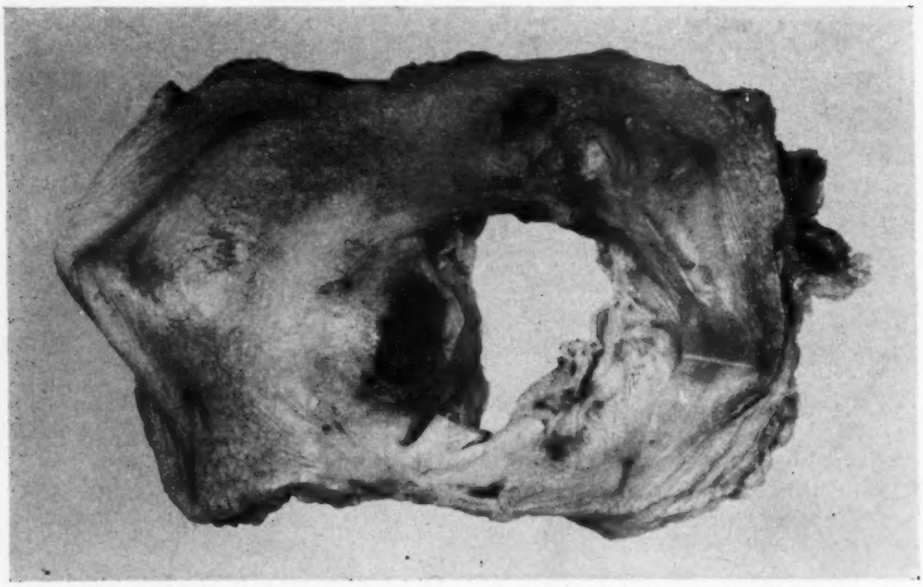

FIG. 1. Specimen from the vulvectomy. In region of the right Bartholin gland there is a raised, firm area 1 cm. in diameter with superficial ulceration as shown. The clitoris can be seen above in midline.

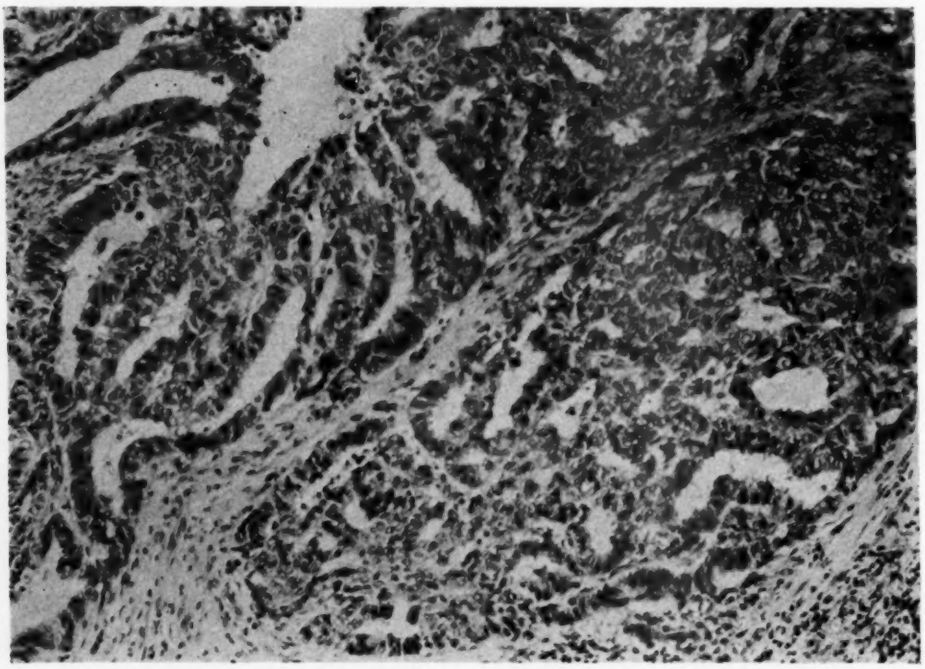

FIG. 2. The section shows a definite adenocarcinoma of the Bartholin gland. There are many anaplastic cells but there is as yet no evidence of invasion of the basement membrane and very few mitosis. A moderate inflammatory cell infiltration is present.

in Simdinger's table are not recorded in Aquinaga's table. (Table 1.)

Undoubtedly there are some proven cases not recorded in the literature and also probably some in which the diagnosis was missed. The absence or confusion of pathologic details in the early reports and, in a few of the later ones, makes critical comment as to the validity of the diagnosis impossible.

A review of statistics from numerous large clinics show that carcinoma of the vulva comprises 3 to 5 per cent of all carcinomas of the female genital tract and

carcinoma of Bartholin's gland 2 to 3 per cent of vulvar carcinomas. In our 18,745 private obstetric and gynecologic patients there were thirty-one patients with vulvar carcinoma, one of whom had carcinoma of Bartholin's gland.

chronic infection or removal of a small cyst.

Honan gave four diagnostic criteria for carcinoma of Bartholin's gland: typical vulvar site, position deep in the labia, connection with the gland duct and presence of intact gland tissue. Shaeffer states

TABLE I

CASES REPORTED SINCE AQUINAGA'S TABLE

Author	Age	Previous Infection	Operation Radiation	Microscopic Pathology	Inguinal Metastasis	Result
1. Boynton.....	54	Swelling 6 mo.	Excision wide; x-ray, second excision after 5 yr.	Squamous	None	Recurrence in 5 yr.; died 1 yr. later
2. Sperl.....	Reported case in *Wien. med. Wchnschr.*, 1943			Not available for details		
3. Cosbie.....	59	Soreness 3 mo.	Refused operation; given x-ray; for recurrence in 3 yr. 200 mg. hr. radium; 1 yr. later radon seeds	Basal cell carcinoma	3 yr. later; metastases, lungs, spine, long bones later	Died 7 yr. after first visit
4. Crossen, R. J.	64	Itch 1 mo., radium and panhysterectomy for an adenocarcinoma fundus 4 yr. before; no recurrence	Vulvectomy wide	Adenocarcinoma Bartholin gland primary	None	No recurrence 3½ yr.

TABLE II

	3 Yr.	4 Yr.	5 Yr.	6 Yr.	7 Yr.	16 Yr.	At Last Report
Excision wide.....	1L	1L 2D	1L	1L	1L	1L	6L 2D
Excision radiation.....	1L	1L	..	1D	..	..	2L 1D
Radiation x-ray.....	..	..	..	..	1D	..	... 1D
Vulvectomy.....	1L	..	..	..	..	..	1L
Vulvectomy gland resection.....	..	1D	..	..	..	..	... 1D
Vulvectomy radiation x-ray.....	..	..	1L	..	..	..	1L
Vulvectomy gland resection radiation.....	1L	..	..	..	..	..	1L
							11L 5D

L—living at time of report.
D—dead at time of report.

The diagnosis of carcinoma is frequently missed preoperatively and the true nature of the lesion becomes evident only after an incision has been made for drainage of

that if the skin is intact and the growth is a frank adenocarcinoma, it is proof of the primary site. When the carcinoma arises from the duct, the differential diagnosis

from squamous carcinomas of the vulva is difficult as there is usually some metaplasia of the duct epithelium. In order to clinch the diagnosis, according to Frank and Kehrer, one must be able to trace the continuation of the carcinoma into the duct epithelium. Babson and Meeker believe that the finding of transitional epithelium of the communicating ducts is significant as this occurs on the vulva only in Bartholin's gland. Hidradenoma of the vulva is sometimes mistakenly diagnosed as carcinoma of the vulvovaginal gland.

The case of the youngest patient, nineteen years old, was reported by Beckman and the oldest ninety-one years old, was reported by Pape. Eichenberg in reporting 174 patients with carcinoma of the vulva found the average age to be 58.8 years.

Of the eighty-eight patients reported in the literature there were seventy-three whose age was given. Bartholin carcinoma was found to occur most commonly between the ages of forty to sixty. Twenty-two per cent occurred under the age of thirty and almost 25 per cent occurred after sixty. Hence, carcinoma must be considered in the differential diagnosis in any patient with enlargement of Bartholin's gland.

The signs and symptoms in order of frequency were: a tumor, usually cystic and in some cases painful; an abscess or draining sinus and swelling with soreness or itching.

The enlargement varied from a pea-sized tumor to one the size of an orange; the latter had been present for two years. There were two other patients in whom the tumor had been present for a year, one the size of a lemon and the other as large as a cherry. Rabson and Meeker found that patients had symptoms for an average of fifteen months before consulting a physician.

Treatment varied from wide excision, vulvectomy, vulvectomy with gland resection, radiation therapy either with radium or x-ray and combinations of these treatments.

Of the eighty-eight patients, thirty-seven had no report of their final outcome and there were four cases of sarcoma. Of the remaining forty-seven, nineteen were followed to death or recurrence and, of these, fourteen either died or had recurrences within three years of treatment leaving five of this group who survived longer than three years.

In the group of patients alive and with no recurrence at the time of the report, seventeen had survived less than three years and eleven were alive without recurrence more than three years after operation.

Of the eight patients surviving past three years, five had adenocarcinoma, two had squamous cell carcinoma and in one the type was not determined.

In regard to prognosis, no conclusion can be drawn because of the small number of patients involved.

The type of treatment used in the sixteen patients surviving more than three years after operation and their survival times are shown in Table 11.

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CARCINOMA IN EXSTROPHY OF THE BLADDER*

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THIRTY cases of carcinoma occurring in the exstrophic bladder have been reported in the literature. We wish to report an additional case, making a total of thirty-one reported cases.

McCown[16] summarized the reported cases of exstrophy of the bladder in 1940 and added one case, bringing the number of reported cases up to twenty-five. He did not include the case reported by Montpellier in 1935.[17] In 1943, Abeshouse[1] reviewed the entire subject and added one case. Graham[6] reported two cases in 1942 and Etherington-Wilson[5] reported the thirtieth case in 1945. The addition of our case makes a total of thirty-one reported cases of carcinoma occurring in the exstrophic bladder. (Table 1.)

CASE REPORT

The patient, (No. 25086B) a sixty-three year old, white farmer, was admitted to the hospital for the first time on August 6, 1946, with the complaint of hemorrhaging from a mass on the surface of an exstrophy of the bladder. The tumor had been present for over a year. The past history was essentially negative except for the existence of the exstrophy of the bladder since birth. The family history was markedly positive for diabetes mellitus as it was reported that all of his seven brothers and eight sisters had had diabetes mellitus.

On physical examination his temperature by mouth was 98.60°F., weight 128 pounds (usual weight 150 pounds); height 5 feet 6 inches; pulse 78 per minutes and totally irregular; blood pressure 120/76; respirations 18 per minute and regular. The patient did not appear acutely ill. The physical examination was negative except for the following features: There were a few inspiratory râles at the bases of the lungs posteriorly. The heart was fibrillating and there was a loud blowing systolic murmur present over the apex; the umbilicus was absent; the bladder was exstrophic and the left two-thirds of its surface was covered by a friable, bleeding mass which obscured the left ureteral orifice. The right ureteral orifice could be readily seen and urine was noted coming from it. The penis and scrotum were small, the urethra epispadiac. There was wide separation of the pelvic bones with absence of the symphysis pubis. There were varicose veins of both lower extremities.

Laboratory findings were as follows: Urine from the right ureter showed no albumin, no sugar. The left ureteral orifice was obscured by the neoplasm. The non-protein nitrogen was 44 mg. 100 per cc. of blood; hemoglobin 64 per cent; red blood cells 4,300,000; white blood cells 8,100; with 83 per cent polymorphonuclear leukocytes. The Kahn test was negative. X-ray of the chest revealed no pathological condition. An intravenous pyelogram was done which showed normal filling of the calyces and pelves of the kidneys bilaterally but the left ureter was shown to be dilated. X-ray of the pelvis showed wide separation of the pubic bones and absence of the symphysis pubis. Biopsy of the tumor of the bladder was reported by the pathologist as being adenocarcinoma.

The patient was prepared for operation. An attempt was made to clear the colon by administering succynlsulfathiazole by mouth, cleansing enemas and low residue diet. On August 21, 1946, the ureters were transplanted into the sigmoid section of the colon by the Coffey 1 technic and the bladder was excised.

The postoperative condition of the patient was good. Chemotherapy and intravenous fluids were continued.

On August 23rd, the non-protein nitrogen was reported as being 84 mg. per 100 cc. of blood. He appeared mentally confused. The abdomen was distended and was treated by stomach tube and constant suction. On August 24th, his condition appeared very poor. A right pyelotomy was done at which time the right kidney pelvis and the right ureter were distended with urine. A mushroom catheter was

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TABLE I

CASES SUMMARIZED BY McCOWEN[16] AND THE SUBSEQUENTLY REPORTED CASES

Case	Year	Author	Sex	Age	Lesion	Treatment	Comment
1	1895	Bergenhern (quoted by Lacene and Hovelaque)	M	35	Adenocarcinoma	Transplantation of ureters; extirpation	Working 6 months after operation
2	1901	Ehrich (*Beitr. z. klin. Chir.*, 30: 581, 1901)	F	44	Adenocarcinoma	Resection transplantation of ureters and bladder mucosa	Died 8th day from ascending infection
3	1904	Enderlen (*Verhandl. d. deutsch. path. Gesellsch.*, 7: 167, 1904)	F	38	Adenocarcinoma	Radio therapy	Not benefited
4	1905	Lampe (*Verhandl. d. deutsch. Gesellsch. f. Chir.*, 34: 226, 1905)	M	..	Squamous cell carcinoma	Sonnenberg operation	Recovered; not treated
5	1906	Von Elselberg (*Wien. klin. Wchnschr.*, p. 548, 1906)	F	54	Adenocarcinoma	Extirpation	Living 15 months after operation
6	1909	Sargent (*Brit. J. Child. Dis.*, 6: 115, 1909)	M	39	Clinically, carcinoma	None	Not traced
7	1910	Wagner (*Deutsche Ztschr. f. Chir.*, 101: 330, 1910)	M	49	Adenocarcinoma	Biopsy only	Not traced
8	1910	Hager (*München. med. Wchnschr.*, 57: 2300, 1910)	M	66	Adenocarcinoma	Symptomatic	Died from cachexia
9	1910	Schloffer (*Wien. klin. Wchnschr.*, 23: 1158, 1910)	M	46	Carcinoma	Curettage	Result not mentioned
10	1912	Lacene and Hovelacque (*J. d'urol.*, 1: 493, 1912)	M	48	Adenocarcinoma	Symptomatic	Died from cachexia
11	1912	Lacene and Hovelacque, ibid.	F	26	Adenocarcinoma	Not mentioned	Result not mentioned
12	1914	Hunner (In Kelly and Burnam: Diseases of the Kidneys and Bladder. New York, 1914. D. Appleton & Co.)	F	26	Adenocarcinoma	Not mentioned	Result not mentioned
13	1918	Geraghty (In Cab: Modern Urology, Philadelphia, 1918. Lea & Febiger)	..	48	Adenocarcinoma	Not mentioned	Result not mentioned
14	1921	Lower (*Am. Surg.*, 73: 354, 1921)	M	50	Clinically, carcinoma	Transplantation of ureters; excision	Died; abdominal metastases
15	1922	Scholl (*Am. Surg.*, 73: 365, 1922)	F	23	Adenocarcinoma	Transplantation of ureters; excision	Died 2 years after operation from metastases
16	1922	Scholl, ibid.	M	48	Adenocarcinoma	Excision; radium	Reported well 6½ years later
17	1922	Dupont (*J. d'urol.*, 13: 433, 1922)	M	38	Adenocarcinoma	Exclusion of rectum	Died 2 days after operation
18	1924	Murphy (*J. A. M. A.*, 82: 784, 1924)	M	49	Adenocarcinoma	Radium emanation	Examined after 14 months
19	1925	McCarthy and Klemperer (*J. Urol.*, 14: 419, 1925)	M	47	Adenocarcinoma	Diathermy; ureterostomy; nephrectomy; cystectomy	Convalescent at time
20	1928	Judd and Thompson (*Arch. Surg.*, 17: 644, 1928)	F	38	Adenocarcinoma	Cautery excision of bladder	Well 3 years after operation

TABLE 1 (*Continued*)

Case	Year	Author	Sex	Age	Lesion	Treatment	Comment
21	1929	Hammer (*J. d'urol.*, 28: 260, 1929)	M	60	Adenocarcinoma found on Maydl block 10 years after above operation	No treatment; uremic death	No metastases found
22	1929	Hammer (*J. d'urol.*, 28: 260, 1929)	F	55	Adenocarcinoma	Uremic death	No metastases found
23	1930	Scheuer (*Ztschr. f. urol. Chir.*, 30: 299–308, 1930)	M	39	Adenocarcinoma	Removal electrocautery; x-ray therapy; healed after 5 months	Note: This patient had had a plastic operation to reform bladder at 3 years of age
24	1935	Gayet (*J. d'urol.*, 39: 295, 1935)	F	64	Adenocarcinoma	Refused treatment	Lost contact after 1 month
25	1935	Montpellier (*J. d'urol.*, 39: 493, 1935)	M	40	Squamous cell carcinoma	Case was studied, pyelogram made, split function; right ureter was dilated greatly; left ureter dilated	No operation; died a few days after admission; was febrile to 39–40°C. prior to death
26	1940	McCown, P. E. (*J. Urol.*, 43: 533, 1940)	M	62	Adenocarcinoma	Bilateral lumbar ureterostomy	Died; operation, shock; autopsy showed no metastases
27	1942	Graham, W. H. (*Brit. J. Surg.*, 30: 23–32, 1942)	M	48	Adenocarcinoma	Cystectomy; ureteral implant into wound margin	Home 8 months; did well; returned for sigmoid transplantation of ureters; good recovery
28	....	Graham, W. H., ibid.	M	53	Adenocarcinoma	Excision of extensive carcinomatosis bladder; ureters divided and left to form natural fistulas; repair of defect in abdominal wall; ureters discharge in a depression in the lower abdomen	Well 4 years after operation
29	1943	Abeshouse, B. S. (*J. Urol.*, 49: 259–289, 1943)	M	58	Adenocarcinoma	Hutchins and Hutchins method of ureteral transplantation	Died on 22nd postoperative day; acute bilateral pyelonephritis with azotemia
30	1945	Etherington-Wilson, W. (*Brit. J. Urol.*, 18: 62–64, 1945)	F	59	Adenocarcinoma	Ureteral transplantation; diathermy excision of malignant extrophy	Wound infection; died 7 weeks after operation
31	1946	Reid, Westcott, and Summers	M	63	Adenocarcinoma	Coffey I transplantation of ureters into sigmoid colon	Died on 11th postoperative day; pyelonephritis

placed in the pelvis of the right kidney. The non-protein nitrogen was 88 mg. per 100 cc. of blood. The patient showed moderate generalized edema but the next day seemed improved clinically. He continued to be irrational. However, on August 31, 1946, he seemed improved. He talked coherently, and the urine output was satisfactory. The non-protein nitrogen was 78 mg. per 100 cc. of blood. He expired at 5:30 A.M., September 1, 1946, on the eleventh postoperative day in an asthmatic attack that began five hours earlier.

The postmortem examination was limited to the abdomen. The anastomosis between the right ureter and the colon showed good healing whereas the left ureterocolonic anastomosis had

broken down. The left kidney, ureter and site of anastomosis to the colon were sent to the pathologist. The report on this tissue was:

"Chronic purulent pyelitis with very active ascending pyelonephritis. Multiple abscesses in the renal parenchyma. Large intestine shows purulent inflammation extending inward from the serosa and there is a necrotic and purulent tract passing through the wall. Nearby there are coarse sutures in position."

COMMENT

Exstrophy of the bladder is a rare congenital defect manifested by the absence of the anterior vesical and lower abdominal walls with eversion of the posterior bladder wall.

There are four types of exstrophy:[7] (1) Fissura vesicae superior in which there is a normal union of the pubis but a defect in the upper part of the bladder. (2) Fissura vesicae inferior in which the symphysis is developed normally, but the bladder is split inferiorly. (3) Typical complete exstrophy in which the symphysis pubis is absent with varying degrees of separation of the pubic bones. The everted bladder protrudes above the level of the surrounding abdominal wall. Urine may be seen spurting from the ureteral orifices; in older children the mucosa is inflamed. In the male epispadias is always present. The prostate may be absent or cryptorchidism may occur. At times a bifid scrotum may be observed. In the female the clitoris is cleft, the labia rudimentary and the urethra forms an open sulcus. A double vagina or a bicornate uterus may also be present. Other anomalies such as atresia ani hydrocephalus, spina bifida, cleft palate and umbilical hernia may exist in both sexes. (4) Exstrophy of the bladder complicated by intestinal openings on the extroverted area.

The umbilicus is located more caudad than usual or is absent.

According to Higgins[7] exstrophy of the bladder occurs once in 40,000 births and occurs seven times more frequently in the male. Of infants so afflicted, 50 per cent die before they reach the age of ten; 66 per cent die before they reach twenty years of age. "The usual cause of death is the toxemia of renal infection or renal insufficiency resulting from a rapid progressive pyelonephritis or pyonephrosis.[1]

The present treatment of complete exstrophy of the bladder is to transplant the ureters into the rectosigmoid colon at an early age, to remove the exstrophic bladder and later correct the epispadiac. There is only one reported case of a complete exstrophy being successfully treated by plastic operations.[21]

In 1943, Higgins[7] presented nineteen cases of exstrophic bladder in which the patients were operated upon during the first year of life with only two postoperative deaths. His plan of operation is to transplant the right ureter into the rectosigmoid colon and after ten days to transplant the left ureter and excise the exstrophic bladder. The epispadias is corrected at five to six years of age. In two cases one ureter was transplanted and a nephrourectomy was performed on the opposite side because of a dilated ureter and hydronephrosis. His method of uretero-intestinal anastomosis is a modified Coffey I procedure.

In 1945, Schaefer[18] reported two cases of exstrophy of the bladder operated upon successfully at two months of age.

Attempts to anastomose the ureter to the colon were unsuccessful until Coffey[2,3,4] developed a method of uretero-intestinal anastomosis whereby the ureter lies submucosally for a few centimeters in the wall of the colon. As the fecal mass passed through the colon it would compress the ureter tending to prevent entrance of feces into it. In the Coffey I technic the severed ureters after being placed submucosally were introduced into the bowel through a small hole in the mucosa. In the Coffey II technic a ureteral catheter was sewed in the ureter and brought out through the anus; in the Coffey III technic the colon was not entered except to place a necrosing suture through it and the ureter. The Coffey technic of uretero-intestinal anas-

tomosis has carried a high mortality rate in the past.[6]

The problem has been to get a successful anastomosis without the development of obstruction and all the undesirable sequelae resulting therefrom.

Hinman and associates[7] from experimental work found that "Infection of the abdominal wound from contamination at the time of the operation is more imminent than peritonitis." The problem involved in transplanting the ureter into the colon is primarily to secure healing at the ureterocolonic anastomosis without the development of obstruction at this point. Hinman and associates[10,20] investigated the anatomy of the ureter as it entered the cloaca in birds, the cloaca being comparable to the colon in the potentiality of infection. They found that the ureteral musculature and the cloacal musculature in birds "retain a relationship as totally independent as if the ureter were artificially implanted." They found, however, that severance of the ureters in chickens and their reimplantation into the cloaca resulted in obstruction of the urinary tract in 91 per cent and ascending infection in 87 per cent of the cases. From this they concluded that: "The problems of ureterocloacal reimplantation, therefore, presents no peculiar features apart from those of uretero-intestinal anastomosis." They found further[19] that the reimplantation of the ureters into the bladder in dogs is not complicated by obstruction and ascending infection of the urinary tract which occurs after implantation of the ureters into the colon. From this they[11] concluded: "The end of the implanted ureter constitutes an area of crucial importance in determining the success or failure of a uretero-intestinal anastomosis."

Hutchins and Hutchins[12] reported two cases of exstrophy of the bladder in which the ureters were successfully transplanted into the rectum by an extraperitoneal type of operation. The ureteral orifice is transplanted with a cuff of vesical mucosa around it. This extraperitoneal approach is now regarded as the method of choice in transplanting the ureters for exstrophy of the bladder.[1,15]

Jewett[13,14] has developed a two-stage type of uretero-intestinal anastomosis for cancer of the bladder, reporting thirty-three cases in 1944. Only one death has occurred in his last ten cases so operated upon.

Cancer occurring in the exstrophic bladder is usually adenocarcinoma whereas adenocarcinoma in the normally situated bladder is rare.[1,16] The treatment of exstrophy of the bladder should henceforth be more successful due to our present ability to control infection and to use of the extraperitoneal approach to the implantation of the ureters into the rectum. The operation should be done before the patient is six months of age.

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A. P. Graham studied almost 200 cases of renal tumors and found that the initial symptom was hematuria alone in one-third of all patients and hematuria plus pain in over two-thirds of the patients. Retrograde pyelography was of diagnostic value in two-thirds of the subjects whereas an intravenous pyelogram was diagnostic in only one-sixth of the patients. When first seen, one-third of the patients already had metastatic lesions, principally to the lungs or bones, and almost one-half of the patients were inoperable. It would seem that hematuria is regarded by too many patients and doctors alike as probably signifying passage of a stone, or even as due to more trivial causes hence procrastination results and finally a "too late" diagnosis is made. Let us not forget hematuria *might* mean cancer somewhere in the genitourinary tract. (Richard A. Leonardo, M.D.)

NEUROFIBROMA OF THE STOMACH

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VON RECKLINGHAUSEN[1] pointed out in his first paper dealing with neurofibromatosis of the skin that analogous tumor formations may occur in internal organs such as the gastrointestinal tract where they may attack either the serosa and subserosa or the submucosa. He pointed out that the tumor masses may grow outwardly producing nodular masses on the surface of the bowel wall, or may grow inwardly producing protrusions into the lumen of the gastrointestinal tract.

Askanazy[2] was the first to describe an isolated neurofibroma of the stomach; he suspected the myenteric plexus as the origin of the tumor because not only was there a marked increase in size of the plexus but also numerous ganglion cells between the nerve fibers were found.

Incidence. The incidence of neurofibroma of the stomach is extremely rare as borne out by the following statistical reports. During the period from 1907 to 1921, at the Mayo clinic[3] there were 195 operative procedures performed for gastric neoplasms. Of these, 168 were malignant and but twenty-seven were benign. During the period 1922 to 1927, at the Mayo Clinic[4] thirty-eight benign tumors of the stomach were reported, with the relative incidence of about one benign to eighty malignant, being the same as in the previous series. In both of these series there were no neurofibromas reported among the benign tumors.

Eliason and Wright in 1925[5] collected and analyzed 560 cases of benign tumors of the stomach and added fifty cases of their own. They made no mention of neurofibroma although eleven cases were listed as unclassified.

Judd and Hoerner,[6] in a report of fifty cases of benign tumors of the stomach, encountered one case of neurofibroma.

In a more recent study at the Lahey Clinic covering the five-year period ending 1943[7] there were 464 patients operated upon for gastric neoplasm. Of this group only nine, or 1.9 per cent, had benign growths. The benign lesions included leiomyoma, six, and one each of fibroadenoma, lipoma and neurofibroma.

Paul and Chapman[8] in 1945 reported that of 3,000 consecutive cases of gastric neoplasm at the Jefferson Hospital in Philadelphia, only thirteen were benign and but one was a neurofibroma. They also reported that of 1,500 consecutive gastroscopic examinations at the State University of Iowa Hospital only one case of neurofibroma was seen.

Finally, from the Cleveland Clinic, Root[9] reports in 1942 that out of 250,000 admission records, only seventeen cases of benign gastric tumors were encountered of which three cases were proven histologically to be neurofibroma.

It is seen that the foregoing reports, from the large clinics of various parts of the country, reveal the incidence of benign tumors of the stomach to range from less than ½ per cent to 2 per cent of all gastric neoplasms and that neurofibroma constitutes about 5 per cent of the benign lesions.

Pathology. Benign tumors of the stomach have been classified by Carli[10] in terms of their origin into four classes: (1) Those originating from epithelium include papilloma and adenoma; (2) those originating from connective tissue and vascular structure include lipoma, fibroma, myxoma and angioma; (3) those arising from muscular structures are myomas and (4) those arising from nerve structures are neuromas.

Those arising from the muscular coats in the stomach wall occur with the most frequency and comprise about 60 to 70 per cent of all benign tumors of the stomach. The neuromas, as previously stated, comprise but about 5 per cent.

Neurofibroma occurs more frequently on the lesser curvature of the stomach and more toward the pyloric end. They generally grow outward from the coats of the stomach producing a bulging mass into the peritoneal cavity. Occasionally, the growth points inward into the cavity of the stomach and in so doing thins out the protruding mucosa, and ulceration in the area of greatest tension soon follows. The tumors as a general rule are slow in their rate of growth. They do not infiltrate the surrounding tissue, the attachment being usually a localized type of dissecting growth in between the layers of stomach wall. This fact explains the ease with which the tumor may be surgically "shelled out," very little trauma being produced to the adjacent stomach tissue. Degeneration in the tumors of larger size is not uncommon. Most writers are of the opinion that about 10 per cent undergo malignant changes and these changes usually occur in those cases associated with a generalized neurofibromatosis.

Macroscopically, the tumors are usually of a pearly-grey color. The consistency is of a semi-hard character, appearing to be moderately soft at first palpation but then upon sustained pressure a definite hard firmness is appreciated. On section the surface is observed to be of a homogeneous, moist, glistening character and having a whitish-grey to pinkish-grey color. The mucous membrane and serous coats covering the tumor are usually smooth and glistening. The surface of the lesions are not very nodular as a rule.

Microscopic studies have caused many controversies among pathologists. They are all agreed that the majority of the tumors arise from the subserous or Auerbach's plexus and a lesser number arise from the submucous or Meissner's plexus. The exact nervous elements from which growth takes place has been the point of disagreement. There is the group that holds that the proliferation takes origin from the cells of the nerve sheath (the cells of Schwann), and they have called the tumors Schwannomas and claims they are of ectodermal origin. There is another group that maintains that the tumors are of mesodermal origin, proliferation taking place from the perineurism and endoneurium. They claim the nerve sheath cells of Schwann take no part in the growth. They point out that the lesions have been observed to occur in nerves not having a sheath as the optic and olfactory nerves.[11] However, there are many writers[2] who are of the opinion that probably there is proliferation from both the mesodermal and the ectodermal elements except in cases of lesions involving cranial nerves.

Microscopically, the tumors characteristically all exhibit proliferation of nerve filaments arranged in thick bundles or tracts. Many fibroblastic cells intermingled in greater or lesser numbers with the fibrillar elements are seen. In many cases the dissecting character of the growth can be observed to split or dissect into the smooth muscle fibers. The nuclei in many areas are seen to be of a large oval shape and lay parallel to the fibrillar elements. Cystic degeneration is frequent and may be visible only on microscopic examination. Hemorrhages may occur in the softened tissue and myxoid degeneration has also been reported.

Symptomatology. The symptoms of neurofibroma of the stomach are greatly variable, presenting no characteristic findings that might aid one in making a correct diagnosis. The symptoms depend a great deal upon the size and site of the lesion. The presence or absence of other coexistant disorders in the stomach[4] will greatly influence the clinical picture. The patient may present a typical ulcer story, with laboratory data lending support to the history given and in whom ulcer management will give temporary relief.[12] Hemor-

rhage is a frequent symptom which may be caused by the tumor itself or by a coexistant ulcer, the patient presenting hematemesis and/or tarry stools. The smaller tumors, not associated with ulceration of the mucosa and located distant from the pylorus, will present no symptoms and are only discovered at autopsy or at operation for coexistent disorders at a distant focus. If the tumor is situated close to the pylorus, signs and symptoms of obstruction are common. If the tumor is pedunculated in character, intussusception into the duodenum may occur, producing pain, nausea and vomiting. The pedunculated mass may recede and symptoms will subside. Repeated attacks of this nature would present an intermittent clinical picture of high obstruction.

Walters[13] states that the most frequent and most important sign of a benign tumor of the stomach is anemia. This anemia is caused by the so-called "weeping type" of bleeding and may escape the notice of a patient until pallor of the skin is marked or a blood examination reveals severe anemia to be present.

Pain of a severe character is an uncommon symptom unless, as pointed out, obstruction ensues with those lesions at the pylorus. Pain may be of a very dull nature and the sensation of heaviness in the stomach or a feeling of discomfort will be the only complaint. Vague symptoms of indigestion are a common finding.

Tumefaction in the epigastrium may be noticed for years, slowly, progressively increasing in size but with no distressing symptoms, especially in those cases in which the lesion is a distance from the pylorus. Large tumors of this nature, if close to the esophageal hiatus, may eventually cause symptoms of esophageal obstruction.

Loss of weight and strength may or may not be found, depending upon how much the appetite and the intake of food is impaired. As a general rule the appetite is good. Malignant degeneration, ascites, perforation and peritonitis are of very rare occurrence.

Diagnosis. Because of the great preponderance of malignancy of the stomach over benign lesions, preoperative diagnosis of a benign lesion is rarely ever made. The possibility of a benign tumefaction should always be kept in mind for it is a source of courage to operate upon those patients who have symptoms that not only appear malignant clinically, but also in whom radiographic and laboratory findings seem to point to an absolute diagnosis of inoperable malignancy.

A careful, complete evaluation of the clinical signs and symptoms together with adequate laboratory study may in many cases enable us to arrive at a more correct diagnosis.

In twenty-three cases of histologically proven neurofibroma of the stomach,[14] ten cases were diagnosed as gastric malignancy, two cases as benign lesions of the stomach; in three instances a diagnosis of mesenteric neoplasm was made; in another three instances a diagnosis of ulcer was made and each of the remaining cases were diagnosed as a splenic or colonic tumor, a pararenal tumor, a retroperitoneal tumor and a biliary calculus respectively. This illustrates the interesting, but yet difficult problem that one is confronted with in making a diagnosis.

The following points toward making a differential diagnosis between benign and malignant tumors of the stomach are offered for consideration:

1. Neurofibroma of the stomach is occasionally associated with general neurofibromatosis. Sometimes, when they accompany cutaneous neurofibromatosis, there will be a history of hereditary tendency to the disease and a history of low mentality and arthritis deformans. The hereditary tendency has been definitely established.[15] Family history should be carefully investigated for evidence of neurofibromatosis and the possibility of a visceral localization must be seriously pondered in every case of multiple neurofibromatosis of the skin.

2. Spühler[14] has called attention to the fact that in reviewing twenty-three cases of solitary neurofibroma of the stomach that it is found in the more advanced age group, the youngest patient being fifty-nine years of age.

3. A history of hemorrhage with tarry stools on and off for an extended period of years would suggest a benign lesion rather than a malignant one.

4. The presence of a slow-growing tumor over a period of years without marked general signs of malignancy would be indicative of a benign growth.

5. A history of repeated intermittent attacks of high obstruction may be significant of a ball valve action or intussusception of the tumor mass into the duodenum, a fact more apt to occur with a benign lesion rather than a malignant one.

6. In tumors in which erosions into the mucosa may occur, fragments of tumor tissue may be found in the vomitus or be recovered from gastric lavage. This is of extremely rare occurrence but should it happen, biopsy would definitely establish the diagnosis.

7. Study of gastric analysis is of little aid in diagnosis for in most cases the curves are well within normal limits, there being very little change in gastric secretion.

8. Gastroscopic visualization together with peritoneoscopic visualization should prove of great assistance in establishing a diagnosis.

9. Regarding x-ray diagnosis of benign tumors of the stomach, Moore[16] states that a benign gastric tumor usually produces a filling defect which is centrally located and clearly circumscribed, sharp, smooth edged and punched out in appearance. The rugae may be distorted at the actual site of the lesion, but those surrounding the tumor are almost normal in their arrangement and distribution. The lesion will not interfere with peristalsis or obstruct the pylorus unless seated in the antrum. There will be no niche present or incisura seen because benign lesions do not cause contraction or spasm of the stomach. It must be conceded that while these signs are reasonably diagnostic they are not absolutely pathognomic of benignancy.

In view of the increase and diffusion of gastroscopic, peritoneoscopic and roentgenologic experience and the rather emphatic traits of benign tumors, it is probable that their diagnosis will be made more often and more confidently in the future than it has been in the past.

Treatment. Surgical intervention is the treatment of choice. Once a diagnosis of gastric neoplasm is made or suspected, all efforts toward the establishment of physiologic, protein, electrolyte and fluid balance are to be instituted. Hemorrhage, if present, and anemia are to be combatted.

When this preparation together with a careful survey of cardiac and general status of the patient is attained, then surgical exploration should be performed with the aim of removal and further study of the tumefaction.

Bearing in mind the multiplicity of neurofibromatosis, a careful search for other intra-abdominal conditions should be carried out at the time of operation. This point is well borne out by the case reported by Golm and Christeller[17] in which two tumors of the stomach were found, several in the small intestine, several on the periosteum of the tibia and one in the temporal lobe of the cerebrum.

The operative procedure itself depends upon the size and location of the lesion. If the lesion is not extensive and is situated on the lesser or greater curvature, simple excision followed by repair of the gastrotomy wound will suffice. If the lesion is at the pylorus, depending upon the amount of involvement, excision with gastroenterostomy or gastrectomy may be indicated. If the lesion is extensive and involves the greater and lesser curvatures at the mid-portion of the stomach, then a sleeve resection would be a wise choice of operation.

CASE REPORT

M. M., a white female sixty-five years of age, was admitted to the Norwegian Hospital on August 19, 1946, with a diagnosis of carcinoma

of the splenic flexure of the colon. The patient stated that in 1942 she first began to notice gas formation in her stomach shortly after eating. This progressed for a while and then she noticed that belching and nausea ensued soon after. She stated that at times it felt as if her stomach "fell" and then she would be greatly distressed until her stomach went back in place again. She had many periods, however, when she was entirely free of symptoms for weeks at a time. Her periods of distress lasted sometimes for days and occasionally she would be distressed to a greater or lesser degree for a week. For the past four months, however, she stated that an annoying, dull ache has been more or less constantly present in the left upper part of her abdomen. The dull ache was usually aggravated by the intake of any and all foods and was not relieved by any food or stomach medicine. She suffered a great deal with gaseous distention, eructations and nausea and almost invariably had to have a defecation after each meal. Of late she has also noticed alternating loose and hard stools, but the color has always been normal and no blood or mucus was ever noticed. There has been a declining appetite to the extent that the odor of food is unpleasant. Her best weight has never been more than 116 pounds and at present it is 107 pounds. Physical adequacy has also been failing. The review of the systems revealed no other complaints. Her past history revealed a hysterectomy for fibroids and an appendectomy in 1936; otherwise her health had always been good with the exception of an occasional cold. The family history was non-contributory.

Physical examination revealed an elderly, white female of short height and medium build. Nutrition appeared good although she weighed only 107 pounds. Hemic component appeared fair. She was admitted ambulatory and was in no distress but her general physical stamina did not appear good. Examination was essentially normal throughout, with the exception of the abdomen. The abdomen was flat and soft. There was a palpable, discrete, firm, somewhat irregular, slightly tender mass in the left subcostrum which moved up and down on deep respiration. The mass was about 5 by 5 by 8 cm. in size.

The admission blood study revealed 3,240,000 red blood cells, 60 per cent hemoglobin, 19,950 white blood cells with 87 per cent polymorphonuclear cells and 13 per cent lymphocytic cells. The urine examination revealed a trace of albumin and some granular débris with a few epithelial cells microscopically. Blood chemistry studies were within a normal range and gastric analysis was also within normal limits. Barium enema studies revealed a redundancy of the transverse, descending and sigmoid colon with a partial loss of haustral markings of the descending and sigmoid colon. The postevacuation film showed that practically all the barium had been expelled.

Fig. 1. Gastrointestinal series; five-hour film.

Study of the gastrointestinal series revealed a large, well rounded filling defect on the lesser curvature of the stomach. (Fig. 1.) A few irregular collections of barium appeared in this area which apparently communicated with another irregular collection of barium about 5 to 6 cm. medially and was situated just to the left of the second lumbar vertebra. This second collection of barium was present both in the five-hour and twenty-four hour films but was not seen in the forty-eight-hour film. The meal proceeded normally throughout the balance of the gastrointestinal tract and no other pathologic condition was noted.

The patient was given adequate physiologic preparation with 500 cc. of whole blood, intravenous glucose, saline, vitamins and proteins; and on August 30th, eleven days after admission, an operation was performed.

A left rectus incision about 10 cm. long was

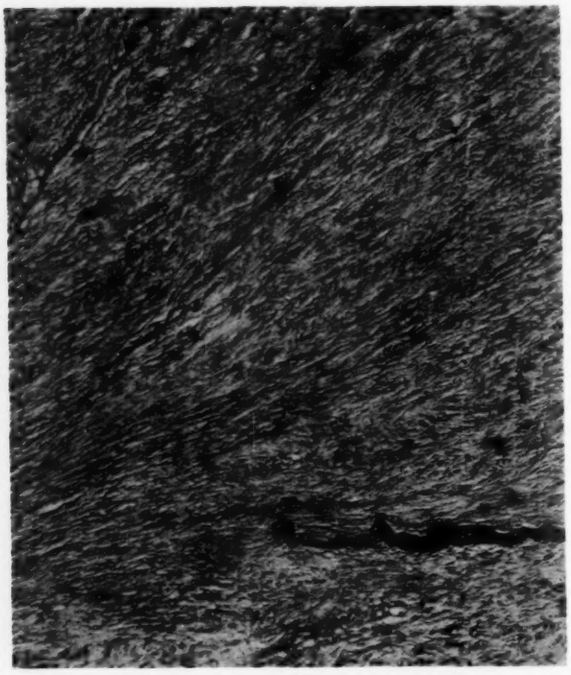

Fig. 2. Microphotograph; magnification × 130.

employed. The stomach was found to be the site of a neoplastic involvement of the lesser curvature measuring about 6 by 6 by 8 cm. The mass was of a pale, whitish color, semi-hard and rubberish in consistency. There were several small whirl-like masses about 1 to 1.5 cm. in diameter attached to the periphery of the mass. The mass was easily enucleated from between the layers of the stomach wall and its connection with the stomach was severed. The gastrotomy wound so formed was closed with an atraumatic chromic No. 00 Connell suture and reinforced with another layer of continuous mattress, seromuscular, fine, black silk suture.

The center of the mass was necrotic and contained mucopurulent material of a very foul odor. The cut surface revealed many areas of hemorrhage and degeneration. The tumor mass was situated between the seromuscular and the submucous layers of the stomach wall. At one point in the inferior pole of the mass there was a communication with the lumen of the stomach which admitted about two fingers.

The microscopic report revealed a thick, hyalinized, fibrous connective tissue capsule. Beneath the capsule were many interlacing strands of fairly dense fibrous connective tissue supporting pale, vesicular spindle-shaped cells. Many bundles or tracts of nerve filament proliferation were seen (Fig. 2.) There were many areas of myxomatous degeneration throughout together with occasional collections of round cells. Pathologic diagnosis: Neurofibroma.

The patient was given adequate physiologic support postoperatively, whole blood, 500 cc., glucose, saline, proteins and vitamins intravenously, for two days. Then small, frequent feedings by mouth for two days were also given. These were gradually increased in amount and intravenous aid gradually decreased. After ten days intravenous aid was entirely discontinued and patient continued to make steady progress. On the twenty-second day postoperatively the patient, having been on a full, generous diet with no limitation for five days, was discharged as fully recovered.

She has been seen several times and her general condition has steadily improved. She is doing all her usual housework, has gained in weight and vigor. She does admit to an occasional "bit of gas," but claims she takes no stomach medicine for relief because the "bit of gas" is quickly belched up and she feels fine. She experiences none of her previous distress or feeling that her stomach is "falling." She is eating well with absolutely no restrictions of any particular items of food.

SUMMARY

1. A general review of neurofibroma of the stomach is presented.

2. Certain points deemed helpful in differentiating between malignancy and benignancy of gastric neoplasm are offered for consideration.

3. A plea is made to make every effort to bring patients with gastric neoplasms within physiologic balance so that they may be explored, and the occasional patient with benign lesion may be saved and not be classified as inoperable and allowed to suffer.

4. A case of solitary neurofibroma of the stomach is reported.

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H. K. Ransom reports his studies on sixty cases of total gastrectomy in which the operative mortality was close to 25 per cent. The author is convinced that such patients lead a reasonably comfortable life and that the incidence of postoperative pernicious anemia is low, only two patients developing this complication some five years after total gastrectomy. (Richard A. Leonardo, M.D.)

PRIMARY HEMANGIOMA OF MUSCLE

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HEMANGIOMA of skeletal muscle is a relatively rare disease. In a series of 1,308 hemangiomas, Watson and McCarthy reported that ten, or 0.8 per cent, occurred in skeletal muscle. Since the first reported hemangioma of skeletal muscle in 1843, some 353 cases have been reported. Shallow, Eger and Wagner in a recent article presented a comprehensive survey of primary hemangiomatous tumors of skeletal muscle, with a complete analytical review of the literature to date, and added two cases of their own.

The following case report is of interest because the hemangiomatous tumor involved the entire external and internal abdominal oblique muscles of the right abdominal wall and hemangioma of muscle was considered in the differential diagnosis because of the presence of phleboliths

CASE REPORT

A white, twenty-eight year old soldier, was admitted to this hospital June 22, 1945, because of a mass in his right lower quadrant. He stated that in 1936 while working for the CCC camps he was struck in the right lower abdomen by a stump. That evening he was taken to a hospital where he was told that a "blood-clot" necessitated an operation. He was asked if he wanted his appendix removed at the same time and consented. On returning to duty about three months later, he noticed a "throbbing" and soreness in his right lower quadrant just above the incision. For two years prior to induction he worked as a ship fitter and as a stockman in a wholesale house. All during this time he was aware of a mass in the right lower abdomen. As he described it, the mass was a hard, full area, which became sore on exertion. The patient had been in the army twelve weeks and had finished basic training two weeks before admission to this hospital. He said that during the past four weeks the "lump" had become larger and more tender. The family history was non-contributory.

Physical examination disclosed a high, well-healed, McBurney incision in the right lower quadrant. Beneath the upper portion of this scar was a firm, fusiform, fixed mass extending laterally to the ilium and upward to a point about 4 cm. above the anterior superior spine. The only clear-cut margin of the mass was the upper one which was rounded and smooth. The mass measured approximately 12 by 8 cm. Palpation gave the impression of rubbery consistency and compressibility. The mass and also the adjacent iliac bone were moderately tender. The mass was dull to percussion. Elsewhere the abdomen was soft and non-tender; no other masses were palpable; otherwise, the physical examination was negative.

The blood count, urinalysis, blood Kahn, intravenous pyelogram, barium enema and stool examinations were reported as normal.

Roentgenographic studies of the chest and soft tissue films of the abdominal wall in the region of the tumor were made. The chest was normal. The abdomen showed a soft tissue mass, seen in contour. It was not particularly homogeneous; rather, it had a lumpy appearance. No definite capsule or limiting membrane was seen. The bone of the right ilium was intact and did not appear to be involved. Superimposed upon the liver region were at least three small calcified bodies which had the appearance of phleboliths.

It was our impression that the mass was extra-abdominal and was a fibrosarcoma or lipoma. Because the x-ray studies revealed calcified bodies in the soft tissue mass, hemangioma of muscle was also suspected. On the basis of a palpable mass within the right anterolateral abdominal wall, surgical exploration was undertaken. Under spinal anesthesia, an incision was made over the mass in its long axis. Skin flaps were dissected laterally and medially, exposing a large fusiform tumor which extended from the right twelfth rib to the inguinal ligament, laterally to the crest of the ilium and lumbodorsal area and medially to

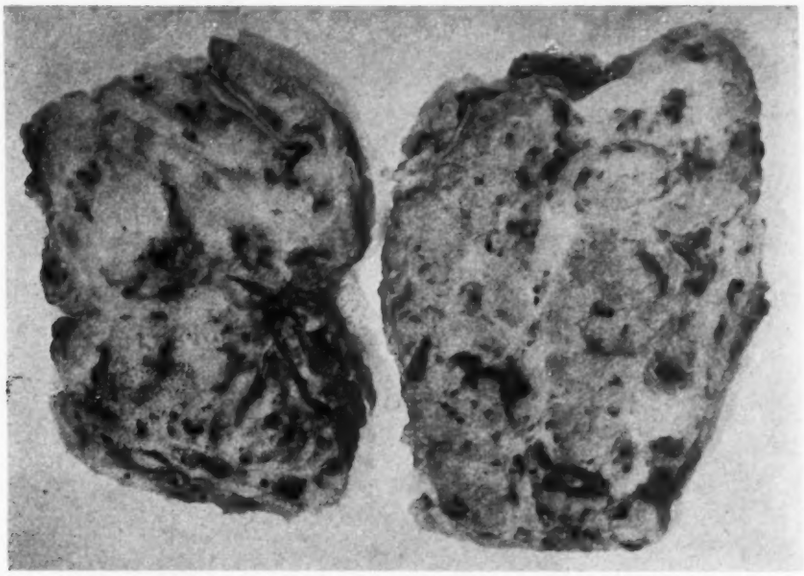

Fig. 1. Cut surfaces of muscle segments after fixation in formalin. Vascular channels of varying caliber permeate the muscles. (Photography by U. S. Army Corps.)

within 2 cm. of the lateral border of the rectus sheath. The tumor mass infiltrated the muscular portions of the entire external and internal abdominal oblique muscles. No cleavage plane could be made out between these two muscles, both being fused by the infiltrating tumor. In depth, the tumor attained the transversalis fascia but did not involve it. It did not extend beyond the superficial fascia. A piece of tissue, removed for frozen section, showed hemangioma of muscle. Although the tumor was not histologically malignant, the clinical history and behavior of this lesion justified wide excision of all involved tissue. The entire external and internal abdominal oblique muscles were excised. Blood loss from the vascular tumor necessitated transfusion on the table. However, the patient's convalescence was uneventful.

The specimen consisted of many large pieces of voluntary muscle; the total weight was approximately 1,200 Gm. (Fig. 1.) Although they varied in size and shape, they were structurally similar. Large areas of muscle fibers appeared normal, but about half of each cross-section was composed of vascular channels, fibrous connective tissue and yellow fat. The channels varied in diameter and all had thin walls. There were occasional hemorrhages into the surrounding tissues. The thin-walled vessels were located in the muscular tissue as well as in the perimysial and intermuscular fascial planes. Thus was formed a solid, firm, rubbery mass. Isolated clusters of muscle fibers appeared tan and dull in contrast to the red, glistening more normal fibers. Many slides from representative pieces of the specimen were studied. (Figs. 2 and 3.) The essential lesion in all was similar. Blood-filled spaces of large caliber were lined by a single layer of endothelium. These vessels permeated the striated muscular tissue, accompanied by varying degrees of fibrous scarring and fatty replacement. Often the fibrous areas contained infiltrates of lymphocytes, plasma cells and eosinophil polymorphonuclear leukocytes. Scattered deposits of greyish-brown, finely granular pigment were seen in the interstices of the fibrous tissue. Muscle fibers isolated by the process appear pale and swollen. No cytologic evidence of malignancy was noted in any of the various types of cells. Pathological Diagnosis: Hemangioma, cavernous, of muscle.

The patient was observed at regular intervals. On December 10, 1945, six months after operation, he appeared in excellent health. The wound was well healed and there was no evidence of recurrence of the tumor or development of a hernia.

The clinical picture of hemangioma of muscle is varied, depending upon the site of occurrence. Symptoms may persist from one to several years. Pain, the most com-

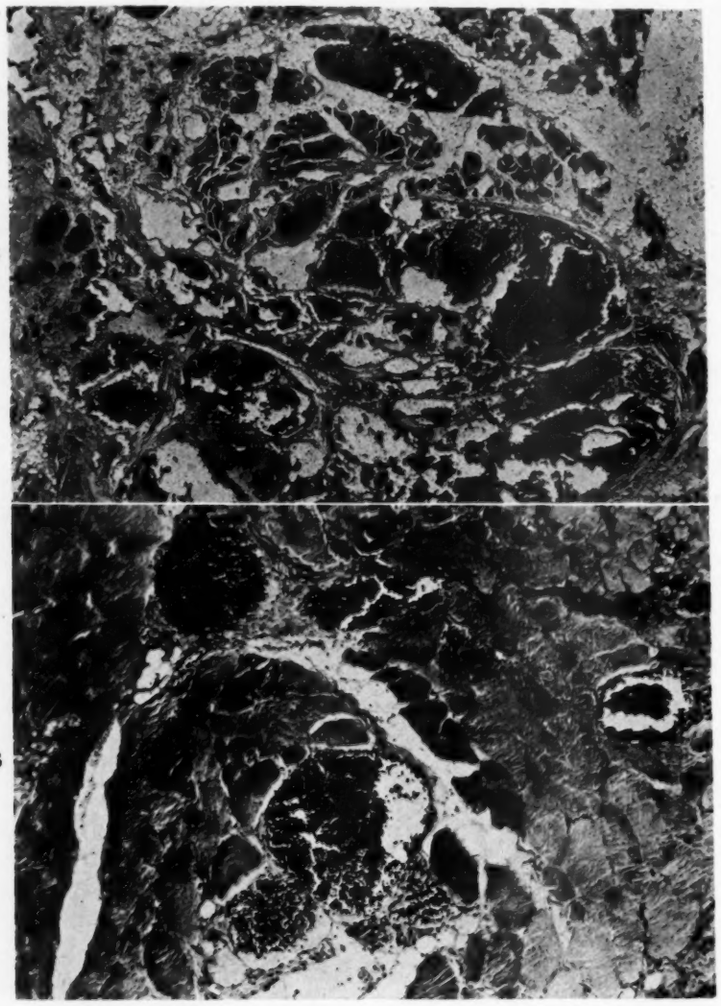

FIG. 2. Microscopic picture of cavernous hemangioma showing fatty and fibrous replacement of degenerating and atrophic muscle fibers. × 30. (Photography by Army Medical Museum.)
FIG. 3. Angiomatous invasion of muscle bundles, interstitial round cell infiltration, fatty and fibrous replacement. × 145. (Photography by Army Medical Museum.)

mon symptom, is localized at the site of the tumor. It varies from a dull aching fullness to a sharp throbbing sensation. The pain may be aggravated by exertion and will usually subside with rest. Palpation usually reveals a fixed mass which may be ill defined or sharply demarcated. The mass may feel fluctuant, soft or firm; more often it has a rubbery consistency. It is usually tender to deep pressure and pulsations may be detected. The most common site of occurrence is in the muscles of the lower extremities although any striated muscle may be affected. One or several muscles may be involved.

COMMENT

It is interesting to speculate upon the possibility of the existence of the tumor prior to injury. The concensus is that hemangiomas are congenital and that trauma is frequently an important factor in activating the growth of the tumor and development of symptoms. In the collected series of Shallow, Eger and Wagner, trauma was reported related to the onset of symptoms in 17 per cent of the cases.

The condition must be differentiated from hematoma, fibroma, neurofibroma, fibrosarcoma, lipoma, hydatid cyst, myoblastoma and rhabdomyoma. Exploratory

puncture and roentgenological studies are the most valuable aids in establishing a correct diagnosis. Phleboliths shown by x-ray films are present in about 48 per cent of the cases. Exploratory puncture reveals blood in approximately 98 per cent of the cases.

Treatment. Surgical excision is the procedure of choice. Shallow, Eger and Wagner report improvement or cures in 90 per cent of their collected cases.

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Bony defects are present, especially in the skull or ribs. When removed and examined, the tissue is found to resemble that present in cases of Schüller-Christian's disease. However, from then on, no further similarity has been found between these two conditions. Patients with eosinophilic granuloma of bone, present localized pain and tenderness and later a localized swelling, first hard and later softer. Slight fever and leukocytosis may be present but eosinophilia is a rather rare finding, occurring in only 10 per cent of the cases. Treatment is by surgery and radiation and the condition is apparently not fatal. (Richard A. Leonardo, M.D.)

UNRUPTURED PRIMARY OVARIAN PREGNANCY*

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THE possibility of ovarian pregnancy has not always been admitted. Lawson Tait,[1] the first surgeon to operate on a patient with tubal pregnancy, declared that ovarian pregnancy was an impossibility. Authorities report that many of the early cases were those of dermoid cysts.[2] However, Catherine van Tussenbroek[3] in 1893 and Thompson[4] nine years later, produced undeniable proof of the existence of ovarian pregnancy.

In 1941, Wilson and Robins[5] reviewed the literature on ovarian pregnancy and stated that, including their own case, there were fifty-nine authentic cases reported. This review included the forty-eight undeniable cases reported by Wollner[6] in 1932, the four cases reviewed by Russell and Black[7] in 1940 and seven more reported since 1940. Thomas[8] reported a case in 1943, and stated that five more cases had been published between June, 1941 and November, 1941 by Simard,[9] Nicholls,[10] Eckerson,[11] Ross and Gledhill[12] and Curtis,[13] bringing the total to sixty-five. A review of American and British journals to date, since the report of Thomas, reveals fifteen additional cases, including the one of Mann, Meranze and Lief[15] who argued the secondary or primary nature of their case.[14–27] It is assumed that the case reported herein brings the total to eighty-one.

It is worthy of note that in 1942, Courtiss[16] stated in his review of the literature that there were eighty-nine authentic cases reported, including his own, Wollner's[48] undeniable cases and others. Therefore, it is apparent that there is a great discrepancy as to the number of authentic cases published. This confusion among authorities apparently results from the lack of strict interpretation of primary ovarian pregnancy according to the definite criteria set forth by Spiegelberg[28] in 1878. Although the actual incidence of the condition remains uncertain, there is no doubt that primary ovarian pregnancy is still a comparative rarity.

CASE REPORT

The patient, Mrs. L. G., a white, married housewife, aged twenty-three, was first seen in the office by one of us (S. S. W.) on July 8, 1946. She complained of pain in the right lower quadrant, irregular menstrual bleeding, dyspareunia and dyschezia. Two weeks after her last menstrual period, on June 1, 1946, she began to have vaginal spotting. This staining continued for one week and then on June 26, 1946, she started to bleed moderately; this continued up until the time of the examination. For the past month she had noticed mild dyspareunia and dyschezia. For several weeks she experienced pain and fullness in the breasts. Her menstrual and marital history revealed that the menarche occurred at twelve years of age and her periods had always been regular of the 5/28 day type with slight dysmenorrhea on the first day. The patient has been married four years during most of which her husband had been in military service. He has been back eight months. She has never previously been pregnant. The past history disclosed that her only serious illness had been scarlet fever. Her surgical history consisted of tonsillectomy and adenoidectomy at the age of seventeen and an appendectomy in 1941.

The physical examination disclosed the following: The patient did not appear acutely ill; she weighed 119.5 pounds and was 63 inches in height. Her blood pressure was 90/60. The general physical examination was essentially negative. The abdominal examination revealed a well healed McBurney incision and some tenderness low in the right lower quadrant. The pelvic examination demonstrated a nulliparous marital outlet. There was no evidence of urethritis, skenitis or bartholinitis. The cervix was in the axis of the vagina, was normal

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in consistency and freely moveable. The uterus was normal in size and anteverted. Mobility of the uterus caused only slight pain. In the right adnexal region, there was a slightly tender, doughy mass about the size of an egg. The left adnexa was slightly tender and thickened. The clinical impression was that she had chronic pelvic inflammatory disease and she was put to bed and given sulfadiazine 1 Gm. four times a day for five days.

On July 15, 1946, the patient still had vaginal bleeding but complained of less pain in her right lower quadrant. A pelvic examination at this time revealed a normal sized anteverted uterus. The cervix was normal in consistency. The left adenexa was not palpable or tender. In the right adnexal region, there was a slightly tender, doughy mass the size of a small orange. The sedimentation rate was 23 mm./hr. The tentative diagnosis at this time was that of a corpus luteum cyst and an operation was advised.

On July 24, 1946, under nitrous oxide and ether anesthesia, the abdomen was entered through a Pfannenstiel incision. There was no free blood in the peritoneal cavity. An examination of the pelvis revealed a normal sized uterus in second degree retroversion. The left tube and ovary were normal. The right ovary, except for one pole, was replaced by a hemorrhagic, discrete, doughy, cystic mass which was attached by a few, fine adhesions to the posterior surface of the uterus and right broad ligament. The adhesions were easily separated by blunt dissection and the cystic mass, which was considered to be a corpus luteum cyst in spite of its unusually large size, was brought into the wound. The right tube was normal in appearance and completely free from the ovarian mass. The fimbriated end of the tube, which was patent, was not attached to the ovarian mass. This right tube, being normal, was not removed. The mesovarium was grasped just below the ovarian mass by two curved forceps, one applied on the utero-ovarian ligament and the other meeting it on the infundibulopelvic ligament. A right oophorectomy was performed by excision of the mass above the clamps. The mesovarium was then coapted with continuous chronic catgut suture. The uterus was suspended by attaching the round ligaments by mattress sutures to the anterior surface of the uterus. The abdomen was closed in layers. The postoperative course of the patient was completely uneventful and she was discharged from the hospital on the tenth postoperative day.

Fig. 1. Gross specimen sectioned to demonstrate the gestational sac, surrounding blood and ovarian tissue, with retention cysts exhibited in one pole of the ovary.

The pathologic report by Dr. Clarence I. Owen, pathologist, Grace Hospital was as follows: Gross: The specimen was an ovoid shaped mass measuring 7 by 6 by 5 cm. in size. The surface was smooth and nodulated. On cross section it was found to be an ovary with a centrally located cyst which was lined by a glistening, smooth, sac-like membrane except for one area where there was a slight elevation. Surrounding the lining, there was a considerable amount of blood clot intermingled with somewhat friable tissue and, on the outside of this, there was an outer continuous layer of ovarian tissue. (Fig. 1.) The ovarian tissue could be recognized as forming a cap at one pole measuring 3 by 3 cm. in size and from 8 to 15 mm. in thickness. Within the ovarian tissue there were a few retention cysts. On the side opposite to the ovarian cap the wall of the cyst appeared

FIG. 2. Photomicrograph of blood surrounding gestational sac demonstrating a clump of villi (high power magnification × 100).

to be stretched and quite thin. There was no rupture or break in continuity of the sac at any point. There was no demonstrable fetus within the sac.

Microscopically, ovarian tissue was recognized in the areas described grossly. The cystic structure was found to be a pregnancy in which the fetus was not present. The sac-like membrane consisted of amnion and chorion and surrounding this there was a layer of blood clot within the meshes of which numerous chorionic villi were present. The villi showed both a Langhans' and syncytial layer. (Fig. 2.) The external layer consisted of ovarian stroma and at one pole several retention cysts were seen. Lutein cells, arranged in long sheets (not in the usual manner), were identified in one portion of the ovary.

Diagnosis: Unruptured ovarian pregnancy.

COMMENTS

That the case reported is a true unruptured primary ovarian pregnancy is evidenced by the operative findings and the gross and microscopic examination of the specimen removed at operation. Spiegelberg's criteria are strictly fulfilled, namely: (1) that the fallopian tube on the affected side, including the fimbriae ovarica, be intact and the former completely separated from the ovary; (2) that the gestation sac occupy the position of the ovary; (3) that the sac be connected with the uterus by the ovarian ligament and (4) that ovarian tissue be demonstrated in the wall of the sac.

It is necessary to distinguish at this time between primary and secondary ovarian pregnancy. In the primary type, the fertilized ovum undergoes its entire development within the ovary. In the secondary type, the fertilized ovum begins its development outside of the ovary in some other structure, usually the tube, eventually becomes separated from that structure and then attaches itself to the ovary and continues its development there.

The basis for our classification of this case as one of the primary type, is a total absence, on gross and microscopic examination, of any tissue foreign to the ovary except for the gestational elements themselves.

Recently, Curtis,[13] reporting a case of his own as a primary ovarian pregnancy, casts doubt on that diagnosis by describing a "toboggan slide" position of the fimbriae. He theorizes that the ovum did not necessarily have to be fertilized within the follicle but could be fertilized in the tube and, then secondarily, slide back again on to the ovary.

MECHANISM OF OVARIAN PREGNANCY

Implantation and development of the fertilized ovum may take place ectopically in the ovary, (1) well within its substance, i.e., where the gestation sac forms in the depths of the ovary, and is evenly covered by ovarian tissue. This mode of implantation can be of two types, viz., intrafollicular or interstitial and (2) on the periphery where the fetal sac grows into the peritoneal cavity. This method of ovarian implantation may likewise be of two types, viz., superficial or suprafollicular, as postulated by Teacher,[29] Greenhill[30] and Litzenberg.[31]

These four modes of ovarian implantation are briefly described as follows:

Intrafollicular Ovarian Implantation. According to Leopold,[32] primary ovarian pregnancy always results from fertilization of the ovum before it escapes the graafian

follicle. Until recently, this was considered to be the only mechanism by which ovarian pregnancy could occur. The rarity of ovarian pregnancy, in spite of the accessibility of the ovary and its ruptured follicles to the spermatozoon, can be explained by the fact that the ovum, as it exists in the ovary, must undergo some degree of maturation before it is capable of becoming fertilized. This normally occurs only during its passage through the tube.

Anything that interferes with the expulsion of the ovum from the ruptured follicle may permit a sufficient passage of time to allow the ovum to mature and be capable of becoming fertilized. According to Leopold, the escape of the ovum from the follicle may be retarded by a tortuous channel of exit or by a deep follicle rupturing and discharging its ovum into the cavity of a more superficial one, the spermatozoon reaching the mature ovum after rupture of the superficial follicle. Another theory is that the expulsion of the ovum is retarded by a small blood clot at the site of the rupture; still another theory, as championed by Wollner,[6] is that the ovum is not extruded due to ovarian pathologic conditions involving the tunica albuginea. If the force of the expulsion of the ovum is dependent upon the balance between intrafollicular pressure and the resistance of the surrounding tissue, it is reasonable to assume that any pathologic change in either of the two factors will produce a faulty ovulation.

All of these theories account for the centrally located cases of ovarian pregnancy. Hewetson and Lloyd[33] suggest one more mechanism, i.e., that the fertilized ovum burrows more deeply into the ovary by virtue of its cytolytic power.

In our case, the presence of lutein cells indicates the strong possibility that the ovum, if not fertilized in the follicle, was implanted there after fertilization and then eroded its way deeper into the ovarian tissue.

Interstitial or Juxtafollicular Ovarian Implantation. The implantation occurs outside the follicle in the stroma of the ovary. The theoretical explanation here is that the follicle bursts laterally, due to a tough capsule preventing the normal outward release of the ovum which escapes into the interstitial portion of the ovary. Here it is found by the spermatozoon which enters the follicle when it finally bursts outward. King[34] reports such an authentic interstitial ovarian pregnancy.

Superficial Ovarian Implantation. Here nidation takes place on the surface of the ovary as a result of pathologic or anatomic changes, e.g., peritoneal adhesions, perioophoritis, thickening of the tunica albuginea, cystic degeneration or endometriosis and also abnormal furrows, wrinkles or sulci.

Novak[35] agrees with Meyer that the most common mechanism is cortical implantation of the egg. The theory, advanced by Webster[36] in 1904 and Sutton[37] in 1924, that implantation cannot occur except in the presence of endometrium or displaced müllerian tissue in the ovary is now generally rejected. Although McKenzie,[19] Curtis[13] etc. report cases of ovarian pregnancy associated with the presence of endometrial tissue, there are others, Haeubner,[38] Jordan[39] the authors, who are reporting cases without any detectable endometrial tissue. Stux[40] believes the report of Brougha and Robinson and his own case prove the occurrence of superficial ovarian pregnancy.

In some of the cases of superficial ovarian pregnancy, the corpus lutem was in the opposite ovary and it is likely that during transmigration the ovum had sufficient time to reach the morphoblastic stage when it could more easily attach itself to the surface of the ovary.

Suprafollicular Implantation. This is another type of superficial implantation. It is caused by imprisonment of the ovum by a superficial blood clot at the opening of the burst follicle. The ovum is thus held at its exit where it is fertilized, becomes implanted and develops.

This mode of implantation is exemplified by the case reported by Gerstel.[41] The only other similar case reported in the literature is by Seedorf.[42]

In spite of our present knowledge of ovarian implantation, there is still much difficulty, in many cases, in establishing the particular method of implantation.

Course and Termination of Ovarian Pregnancy. Ovarian pregnancy, like tubal, is pathologic from the beginning; the ovary, like the tube, being anatomically unfit for this purpose. The early implantation and placentation do not differ greatly from intra-uterine pregnancy except for the absence of decidua or decidual cells.

Jordan,[39] who made a careful histologic study of these masses of cells which are usually interpreted as decidual, considers them as probably being lutein cells; these were so interpreted in our specimen.

The placenta usually consists of ovarian tissue, fibrin from the excessive hemorrhage, lutein cells and fetal and chorionic elements, trophoblast and villi.

The usual course in ovarian pregnancy is early rupture of the ovary with the ovum completely or partly extruded into the peritoneal cavity (ruptured ovarian pregnancy). This occurs in the majority of cases by the end of the first trimester, accompanied by moderate or profuse intra-abdominal hemorrhage. In a number of cases, the ovum may die early and be completely absorbed (this probably occurred in our patient); in other cases, the products of conception may undergo degenerative changes at an early period without rupture and give rise to a tumor of varying size (unruptured ovarian pregnancy). This tumor usually consists of a capsule of ovarian tissue enclosing a mass of blood and chorionic villi. It may or may not contain an amniotic cavity.

Apparently, the ovary can accommodate itself to the growing pregnancy more readily than the tube and a higher percentage of recorded cases go to term. Thus, Nichols,[10] in reporting a case of ovarian pregnancy with living mother and child, states that the literature contained thirty-eight cases of ovarian pregnancy which went to the age of viability (seven months) or beyond. These cases cannot be differentiated clinically from abdominal pregnancies.

Another possible termination, as with tubal pregnancy, is the formation of a lithopedion which may be carried for years. In some cases, hydatiform mole formation has been observed.[30] Another interesting observation has been the occurrence of eclampsia in ovarian pregnancy.[17]

Differential Diagnosis. The differential diagnosis depends upon the signs and symptoms elicited preoperatively.

In the presence of intra-abdominal hemorrhage, a differential diagnosis from ectopic tubal gestation cannot be made, positively, before operation. This fact is borne out in the literature when the majority of such cases are diagnosed as ruptured tubal pregnancies. Other causes of ovarian hemorrhage enumerated by Traugott[43] are leukemia, phosphorous poisoning, hemorrhagic diathesis, hypertension, neoplasms, cysts with acute torsion, ruptured graafian follicles, endometriosis and corpus luteum cysts.

In the cases of unruptured tubal pregnancy, when the involved ovary remains intact and forms a cystic tumor, the preoperative diagnosis, as in our case and several such cases in the literature, was corpus luteum cyst.

A corpus luteum cyst often presents no associated characteristic symptoms. With large corpus luteum cysts, however, the symptoms may fall into a certain pattern such as delay of menstruation, slight vaginal bleeding and pain on the involved side. These symptoms, associated with a palpable cyst-like mass, are very suggestive of a diagnosis of corpus luteum cyst. Even at operation, especially if the cyst be intact, a large corpus luteum cyst may be confused with an unruptured primary ovarian pregnancy.

In recent years, particularly in this country, the number of ovarian pregnancies reported has become accelerated (two or

three per year). This is due, we are convinced, to a more stringent examination of the diseased tissues at operation and in the pathologic laboratory. The exact diagnosis in many cases remains obscure until the pathologic specimen is carefully studied.

We strongly recommend that in all cases when a hematoma of any size is found in the ovary, that the possibility of an early ovarian pregnancy be considered and a careful search be made for chorionic villi or parts of a fetus in it.

SUMMARY

1. A case of unruptured primary ovarian pregnancy is presented.

2. The recent English literature is reviewed.

3. The various mechanisms of implantation of primary ovarian pregnancy are described.

4. The course, termination and the differential diagnosis of primary ovarian pregnancy are discussed.

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EVENTRATION OF DIAPHRAGM

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THE condition known as eventration of the diaphragm is not really a diaphragmatic hernia but a diffuse relaxation of half of the diaphragm, simulating a hernia. The exact cause of the condition is not known and the degree of eventration varies greatly.

Eventration of the diaphragm may be congenital or acquired. If the normal development of the phrenic nerve is disturbed, it may be of congenital origin. The muscle layer is replaced by fatty and fibrous tissue and the affected leaf rises into the thorax, followed by some of the abdominal contents. The condition is more common on the left side. Incarceration of the viscera is not possible because there is nothing to correspond to the neck of a hernial sac. Acquired eventration may be acute or chronic. It may follow a lesion of the phrenic nerve or it may be due to degenerative changes in the musculature of the diaphragm itself. Acute eventration of the diaphragm may follow one of the infectious diseases, run a course of a few weeks and disappear.

CHRONIC EVENTRATION OF THE DIAPHRAGM

Under this heading would come the remainder of the cases in which the diaphragm is permanently disabled. This condition may exist some time without symptoms. In all marked cases dyspnea, cyanosis and palpitation are present on the slightest exertion due to the pressure of the abdominal organs on the heart and lungs; difficulty is also encountered in lying upon the healthy side. Pain is an inconstant symptom; constipation is usual and dysphagia paradoxa and hematemesis are occasional. The heart usually is displaced to the right as the lesions are most frequent on the left side. Over the affected side the chest is tympanitic; ausculation reveals gurgling bowel sounds and the absence of breath sounds.

The diagnosis is very difficult, even in the most extreme cases, without the aid of the x-ray. With x-ray ordinarily it is not difficult to distinguish hernia from eventration of the diaphragm. In the latter there is a limited, paradoxical respiratory movement of the diaphragm which is high and well outlined; the abdominal contents lie below. With hernia, on the other hand, the torn diaphragm is not easily outlined and only a portion of the leaflet may be seen. This is not elevated nor is paradoxical movement present but the herniated stomach, colon or small bowel can be seen protruding through the diaphragmatic rent in the thorax. Cases arise, however, in which these distinguishing features are lacking and the exact diagnosis is rendered uncertain.

CASE REPORT

J. J., a white male, age sixty-nine, was admitted to the hospital May 28, 1946, complaining of dyspnea on slight exertion, cyanosis, palpitation, a dull ache over the heart which occasionally was sharp and radiated to the right arm, belching, flatulence, constipation, occasional difficulty in swallowing and severe cramping pains in the epigastrum and lower chest after eating. He had lost weight 30 pounds during the past year which he attrib-

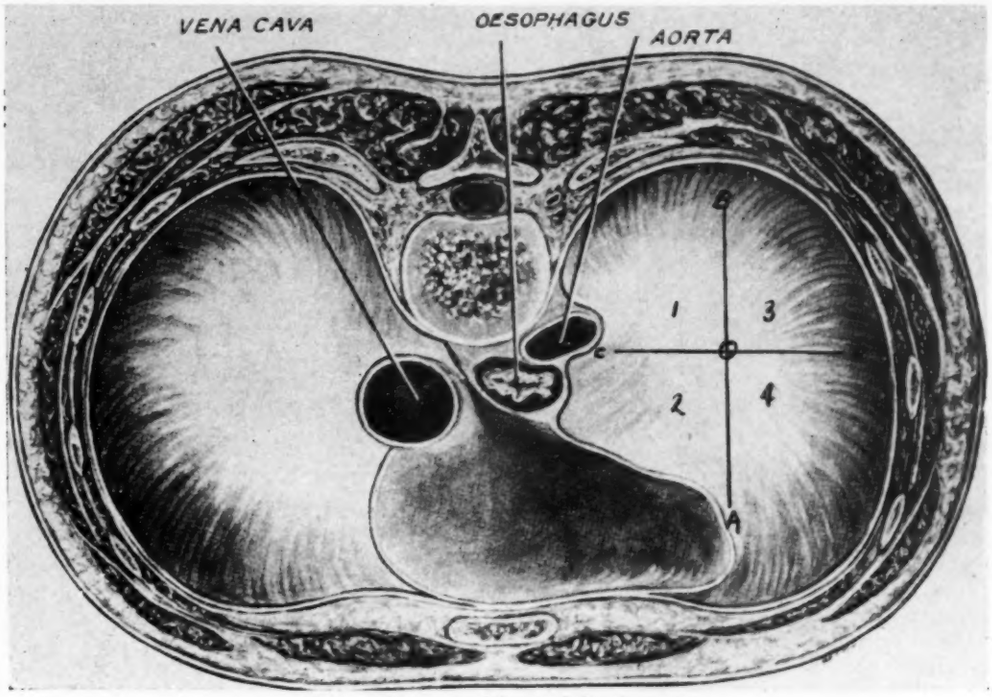

Fig. 1. Shows incisions of diaphragm.

uted to lack of eating because of distress in swallowing food. He had become progressively worse so that he was unable to carry out any of his duties as a janitor. The patient had noticed distress with a change of position or with the slightest pressure on the abdomen and occasionally was awakened at night because of severe dyspnea.

Physical examination revealed a well developed male with obvious signs of considerable weight loss. The blood pressure was 104/70, temperature 98.6°F., pulse 68; respiration 20. Detailed examination revealed bilateral inguinal hernia. The chest was tympanitic and the presence of gurgling bowel sounds and the absence of normal breath sounds in the left chest to about the level of the aortic arch were noted; extrasystole were present; otherwise the examination was essentially normal.

Laboratory examination showed a white blood cell count of 5,850. The hemoglobin was 107 per cent and the red cell count was 5,490,000. The color index was 94, the serum protein 7.0, albumin 4.9 and globulin 2.1 Gm. per 100 cc. The AG ratio was 2.3 to 1. The Wassermann and Kahn tests were negative. The urine was negative. An electrocardiograph revealed evidence of considerable myocardial damage.

Roentgenologic studies revealed an elevation of the left dome of the diaphragm to about the level of the aortic arch. The heart was displaced to the right. A barium enema revealed the transverse colon at the level of the aortic arch and a large air bubble directly to the left of the displaced heart was noted. The diaphragm was elevated but of normal contour; the bowel and stomach were below it. (Fig. 3.)

The left chest and abdomen were prepared for operation and an ankle vein was used for intravenous injection. With the patient lying on his right side and with the left arm suspended from a rectangular frame, positive pressure ethylene-oxygen-ether anesthesia was administered through a snug fitting face mask. The left chest was opened through an incision over the eighth rib from the mammary line anteriorly to a point midway between the line of the angle of the scapula and the vertebral bodies, posteriorly. Excellent exposure was obtained.

The lung was retracted mesially and anteriorly, exposing the costovertebral gutter. The phrenic nerve was gently crushed to assure temporary paralysis of the diaphragm. The diaphragmatic pleura was incised anteroposteriorly at the mid-point of the distended dome, as shown in Figure 1 as the line A-B. This exposed the diaphragmatic musculature which was separated in the direction of its

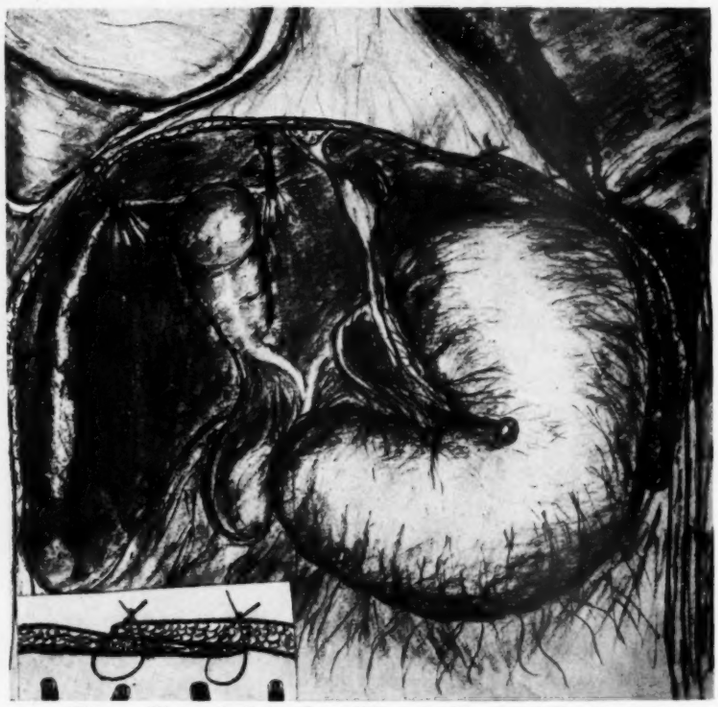

Fig. 2. Shows imbrication of leaves of incised diaphragm.

Fig. 3. Shows postoperative view of diaphragm.

fibers, thus exposing the diaphragmatic peritoneum. The peritoneum was then gently dissected from the lower surface of the diaphragm far enough anteroposteriorly and mediolaterally to allow the amount of imbrication of the dome necessary for the repair of eventration. The media leaf of the divided diaphragm was then incised lateromedially, as indicated by the line O-C of Figure 1, a distance far enough medially to allow the desired amount of imbrication necessary for correction of the anteroposterior arc of the diaphragm. The mediolateral leaf of the incised diaphragm, as indicated by line O-D of Figure 1, was treated in a similar manner. The incised leaves were then imbricated postero-anteriorly, as shown in Figure 2, with interrupted No. 00 chronic catgut. This corrected the excessive anteroposterior arc. The lateromedial arc was corrected by an imbrication of the mediolateral leaves as indicated in Figure 1 as 1-2 upon 3-4. Additional interrupted chronic catgut sutures were placed to secure the pleura over the lines of the incised diaphragm. A Pezzar catheter was inserted posterolaterally through the ninth interspace for pleural drainage. The wound was closed tightly.

Postoperatively, on November 14, 1946, the patient felt very well and was able to carry on hard manual labor without any distressing symptoms.

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HODGKIN'S DISEASE OF THE STOMACH*

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A REVIEW of the literature on Hodgkin's disease of the stomach reveals it to be a rare manifestation of the disease. Thomas Hodgkin[1] first described the disease as a clinical entity in 1832. It was not until 1913 that Schlagenhaufer[2] reported the first case of Hodgkin's disease in which the specific lesion was found in the gastrointestinal tract, namely, the stomach. According to Wallhauser,[3] isolated lymphogranuloma of the gastrointestinal tract is rather uncommon. Mead,[4] after reviewing 16,254 autopsies, reported only three cases in which there was isolated involvement of the gastrointestinal tract. Goldman,[5] analyzing 212 cases of Hodgkin's disease, found the stomach to be involved in only one case. Burger and Lehman[6] reviewed fifty-four cases of Hodgkin's disease and found only two stomach cases. Jackson and Parker,[7] reporting 174 cases found the stomach to be primarily involved in only three instances whereas the stomach was involved in only one of Goldman and Victor's[8] 319 cases of Hodgkin's disease.

The symptomatology is varied, indefinite and bizarre. In Jackson and Parker's[7] report on Hodgkin's disease, anorexia, abdominal pain, nausea, constipation, vomiting, diarrhea, dysphagia, melena and hematemesis are listed as symptoms of the disease in order of frequency. Our patient had epigastric pain, nausea, vomiting, one episode of hematemsis and persistent occult blood in the stools. Hayden and Apfelbach,[9] reviewing twenty-six cases and presenting three of their own, conclude that fever, diarrhea, abdominal pain, rapid cachexia, secondary anemia, leukopenia or a normal white blood count are the presenting signs and symptoms of the disease. They further state that the symptoms can be classified into three groups, namely, ulcerative enteritis and colitis, gastric carcinoma and intestinal obstruction. Our patient simulated the symptoms of gastric carcinoma. His white blood count was normal; he had abdominal pain but did not have intestinal obstruction. Madding[10] described six cases from the Mayo clinic. Two-thirds of his patients had involvement of the lesser curvature as did ours; fever was absent in our patient as it was in his. Bockus[11] states that an ulcer-like syndrome has been reported in several cases. He describes loss of weight, diarrhea, pruritus, jaundice and ascites as symptoms of this disease. He also states that skin pigmentation may be present. Our patient presented an ulcer syndrome over a period of two years. He had lost 19 pounds of weight during a four-year period. He had several episodes of epigastric pain, occurring a few hours after eating, which was relieved by the taking of food and antacids. He was treated as an ulcer patient over a period of two years with modified Sippy diet, antacids, antispasmodics and amino acids. He also had several small pigmented areas of the face and anterior chest wall which were thought to be secondary to an acne of long standing.

The roentgenologic findings are usually not of much help in establishing a definite diagnosis. Craver and Herman[12] state that the roentgenologic diagnosis is usually carcinoma or ulcer. In this case, our patient's symptoms were first diagnosed roentgenologically as an ulcer; later, an x-ray diagnosis of carcinoma of the stomach was made because of a persistent filling defect with ulceration. These findings are usually considered to be characteristic of carcinoma.

The diagnosis is difficult to make pre-

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operatively. Sherman,[13] reviewing seventy-three cases of reports of gastrointestinal Hodgkin's disease, states that the disease usually simulates one of four main clinical entities: gastric carcinoma, gastric ulcer, enterocolitis or obstruction of the bowel. This is in agreement with Hayden and Apfelbach's[9] findings. He also mentions that the final diagnosis is established by necropsy or operation. The diagnosis of Hodgkin's disease of the stomach is usually made only on histologic section. In fact, Avent[14] states that the diagnosis of this condition is practically impossible to make before microscopic examination of the lesion is attempted. Feigenbaum[15] believes that there is no distinct clinical picture of abdominal Hodgkin's disease. It may resemble any intra-abdominal pathology, however, the general clinical features of Hodgkin's disease of the gastrointestinal tract simulates carcinoma which is the usual diagnosis made. In spite of the age of our patient, we thought we had been dealing with a malignancy which had developed at the ulcer site. The patient presented an ulcer syndrome over a period of two years with some relief from the usual ulcer therapy. The constant defect found on x-ray, together with the incomplete relief of symptoms on medical therapy, led us to believe that we were dealing with a malignancy which had developed at the ulcer site. The actual final diagnosis of Hodgkin's disease of the stomach was not made until the histologic sections had been examined.

The treatment recommended for Hodgkin's disease of the stomach is gastric resection.[11,12] Singer[16] reviewed six cases and reported one of his own. He states that isolated Hodgkin's disease of the stomach is an operable lesion and with removal of the diseased tissue the prognosis is good. Steindl[17] reported the first case of lymphogranuloma localized to the stomach in which an operation was successful. We performed a gastric resection on our patient and removed all of the diseased tissue.

CASE REPORT

E. N., a thirty-three year old, thin, white male, came to the Batavia Veterans Hospital on September 23, 1946, complaining of episodes of nausea, vomiting and a burning epigastric pain of two years' duration. He had weighed 131 pounds when he entered the army four years ago; his present weight was 112 pounds. During the period of his symptomatology he described his troubles as, "gas on the stomach" characterized by frequent belching and soft eructations. At various intervals he had mid-epigastric and left upper quadrant tenderness.

During the fall of 1944, he first noticed a burning sensation in the epigastrium, occurring two or three hours after eating, which was relieved by taking some food or drinking a glass of water or milk. The pain was not severe enough to awaken him at night. He reported to his unit surgeon who advised avoidance of fried foods, coffee and other such stimulants. Although the epigastric burning sensation persisted, it was less severe when following this regimen. In April, 1945, he vomited approximately 1 pint of bitter tasting material which was greenish in color. This was followed by episodes of vomiting four to five times daily. There was no blood in the vomitus.

He was then admitted to the station hospital where an x-ray was taken. According to the patient, the film was reported as negative. He returned to his unit and was symptom-free for a period of eighteen days. Vomiting began once again and so he was readmitted to the station hospital. Another x-ray was taken of his stomach and this time a diagnosis of gastric ulcer was made. His upper teeth were removed because they were infected and it was believed that this was contributing to his symptomatology.

He was then sent to a general hospital where he was treated with a bland diet, antacids and bed rest. During his stay in this hospital he experienced only a few episodes of burning epigastric pain and vomiting. When this occurred, he was relieved by taking 1 or 2 ounces of an aluminum hydroxide preparation.

In April, 1946, the patient observed that his burning epigastric pain was becoming more severe. It was accompanied by a siege of vomiting three to four times a day. This episode was of six days' duration. He had hematemesis on one occasion which was described by the

patient as a "mouthful of red blood along with other material."

At this time he was in Quebec and again hospitalized. He was again treated with antacids in milk, a bland diet and bed rest for nine days. When he was discharged, he was relatively asymptomatic. During May and June of 1945, while working as an attendant in a psychiatric hospital, the epigastric burning sensation returned with greater severity. It was accompanied by vomiting two to three times daily. He treated himself with antacids, taking them three to four times a day. He regulated the amounts according to the degree of pain and amount of vomiting. This continued until the time of his admission.

The past history was non-contributory. The patient had acne during his adolescence. A right inguinal herniorrhaphy was performed in 1940, with an uneventful recovery.

The physical examination revealed a thin, white, afebrile male, not acutely ill, weighing 112 pounds. The head and scalp was essentially negative. The pupils were round, regular, equal and reacted to light and accommodation. Extra ocular movements and the conjunctiva were normal. The ears and nose were externally negative. No upper teeth were found but the remaining lower teeth were in good condition; buccal and faucial structures and surfaces were normal. The thyroid was not palpable. There was no cervical adenopathy or venous engorgement in the neck. The thorax was normal in size and shape. The lungs were normal to palpation, percussion and auscultation. The blood pressure was 105/50. The heart borders were within normal limits. The pulse was regular and of good quality; no arrhythmia, murmurs or friction rub were present. The herniorrhaphy scar in the right inguinal region was well healed and not tender; there was a small area of tenderness in the left upper quadrant but no masses were palpable in the abdomen. The liver and spleen could not be felt. Examination of the external inguinal rings revealed no hernia. The genitourinary system was externally negative and the rectal examination was also negative. There were no palpable lymph glands. There was no orthopedic imbalance, asymmetry or limitation of motion of the muskuloskeletal system. The patient's reflexes and reactions were normal.

The laboratory findings were as follows: The Wassermann and Kahn tests were negative. The hemoglobin ranged from 76 to 92 per cent; the red blood count varied from 4,040,000 to 4,800,000 and the white blood count varied from 7,600 to 9,800. The differential leukocyte count on several occasions showed 73 to 79 per cent polymorphonuclears, 18 to 24 lymphocytes, 3 monocytes and no eosinophiles. The blood proteins and blood chemistry were within normal limits. The coagulation time was four and one-half minutes and the bleeding time two minutes. The hematocrit was 46 per cent and the vitamin C level 2 mg. per cent. The sedimentation rate was 24 mm. per hour. Urinalyses were normal; gastric analysis (Ewald test meal) on September 28, 1946, showed 50 degrees total acid, 40 free and 6 combined. On October 22, 1946, the patient had 30 degrees total acid, 20 free and 6 combined. Repeated examination of the stools showed occult blood but no ova or parasites.

X-ray findings were as follows: September, 27, 1946, during the gastrointestinal series the stomach showed a slight projection on the lesser curvature which was not locally tender but visible on all films in the posterior surface. The six-hour status showed a small gastric residue. October 11, 1946, the stomach showed a small filling defect associated with a shallow ulceration on the lesser curvature at the angle. There was tenderness in this region. A number of films made with and without compression showed a persistent rigidity and straightening in this region. Comparison with previous films showed that not only was there a lack of healing in the gastric ulcer then described but also as a result of compression studies a filling defect was evident. The appearance suggested carcinoma of the stomach. A chest plate was taken on September 27, 1946 and was reported as negative. This was repeated on October 23, 1946 and was also reported as negative. No abnormality in the lungs, ribs and no mediastinal lymphadenopathy was noted. Gastroscopy was performed on October 17, 1946 and substantiated the x-ray diagnosis of carcinoma of the stomach.

Abdominal exploration was recommended with gastric resection if the lesion was resectable. The patient was prepared preoperatively with blood transfusions, intravenous amigen, glucose, saline, vitamins and a Levine tube with Wagensteen suction. On October 24, 1946, an exploratory laparotomy was performed which revealed a large mass on the lesser

curvature of the stomach just above the angle. There were a few palpable lymph nodes present in the gastrohepatic and gastrocolic ligaments. There was no involvement of the mesenteric nodes. The liver, spleen and small and large intestine were all normal. The mass was found to be resectable. A subtotal gastric resection was performed with gastrojejunostomy (anterior Polya type).

The section of stomach removed showed a large superficial ulcer of the lesser curvature with thickening of the wall around it. The thickening of the wall was due to a soft, yellowish-white deposit beneath the mucosa which caused the latter to be flattened out. This was an ulcerated polypoid growth measuring 6 cm. in diameter and infiltrating the stomach wall widely about it. The shallow ragged ulcer crater measured 3.5 cm. There were five lymph nodes along the lesser curvature, varying in size from a pea to a lima bean, and also three lima bean sized nodes along the greater curvature of the stomach. On section, these were yellowish-white in color and firm.

Microscopic sections through the gastric tumor revealed a fairly typical picture of Hodgkin's granuloma. The granulomatous tissue diffusely infiltrated the surrounding submucosa, infiltrated between the underlying muscle bundles and muscle layers into the mucosa causing atrophy of the gland tubules. Section from the floor of the ulcer showed superficial peptic necrosis, acute inflammatory infiltration and edema. The serosa showed unusually marked edema throughout with occasional scattered focal collections of lymphocytes and plasma cells. The granulomatous areas revealed the usual reticulum cell hyperplasia together with a few Sternberg-Reed giant cells, many lymphocytes, plasma cells, a few polymorphonuclear leukocytes and eosinophiles. Lymph nodes also revealed the same pathologic condition as in the granulomatous areas.

The postoperative course was uneventful. The patient was given blood, glucose, amigen and saline intravenously. Small feedings of 1 ounce of water were started on the second postoperative day and gradually worked up to a modified Sippy diet. The wound healed per primum and the patient was out of bed on the fifth day. After recovery the patient was transferred to the Bronx Veterans Hospital for further treatment in their tumor clinic where he will have deep x-ray therapy and administration of nitrogen mustards.[18]

SUMMARY

We have presented a case of Hodgkin's disease of the stomach; this is a rare entity. Our patient presented an ulcer syndrome with episodes of abdominal pain, nausea, vomiting and a weight loss of 19 pounds during a four-year period. The history is similar to that of other cases reported. The physical examination was essentially negative except for left upper quadrant tenderness. No lymph nodes were palpable in the cervical, axillary or inguinal regions. The positive laboratory findings were an elevated sedimentation rate of 24 mm. per hour and persistent occult blood in the stools. Roentgenograms showed a constant filling defect with ulceration of the lesser curvature of the stomach. X-ray diagnosis of carcinoma of the stomach was confirmed by gastroscopy. The patient was treated by a subtotal gastric resection and gastrojejunostomy. All of the diseased tissue was removed. The final diagnosis was made by histologic examination. We believe the prognosis in this case to be good. Deep x-ray and nitrogen mustard therapy has been advised.

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A. S. Lentino studied five cases of myasthenia gravis and the thymus and found that biopsy showed a malignant tumor (thymoepithelioma) and a benign tumor (adenoma) in two patients and in the remaining three patients there was hyperplasia of the thymus gland. The author, therefore, concludes that a distinct relationship exists between an altered thymus and this disease. (Richard A. Leonardo, M.D.)

ECTOPIC BONE DEPOSITS*

A PARAPLEGIC COMPLICATION

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LITERATURE dealing with injuries of the spinal cord, the subsequent paralysis and complications is growing rapidly. Emergency handling and transportation, the diagnostic phase of neurologic and orthopedic appraisal, whether or not and when to operate, problems of urinary management, occurrence and prevention of decubitus ulcers, nutritional problems, importance of skilled, sympathetic and continuous nursing—all these matters have been dwelt upon thoroughly in other places and will not be repeated here. Accent has been placed upon each in turn, and suffice it to say, each and all must be successfully managed.

Satisfactory rehabilitation means salvaging as much of a tolerable and productive future for the patient as the severity of his affliction will allow. It means he must have successfully escaped the hazards of urinary sepsis and decubitus disease and has won out to at least a wheelchair existence. There is a paraplegic complication mentioned intermittently in recent literature which merits much more emphasis. If at least a wheelchair existence is the goal toward which all the intensive and tedious medical and surgical measures are directed, this paraplegic complication can and on occasion does obstruct that objective.

In an issue of the U. S. Army Bulletin a preliminary report[1] appeared. In this report a study was made of sixty-two cases of paraplegia resulting from disease or injury of the spinal cord or cauda equina. Twenty-three of these patients showed ectopic deposits of trabeculated bone within the muscles or fascial planes, principally over the hip and knee joints. Those patients showing degrees of recovery in function seemed to escape this additional complication for only three developed osseous deposits. Of thirty-five unimproved cases, twenty showed ossifications. An analysis of dermatome levels in the patients with ossification showed no predilection for any particular level. Nor did there appear to be, in comparison with the unaffected group, any "significant difference with regard to sites or severity of injuries, time of operative treatment, presence or absence of decubitus ulcers, urinary tract infection or associated injuries or infections, or blood calcium and total protein levels." Ossifications were said to be recognized as early as forty days following cord injury.

The following clinical case is cited to call attention to the important fact that paraplegics are not out of the woods and into the clearing of manageable convalescence and rehabilitation if the complication of ectopic bone deposits is not anticipated and an effort made to prevent their development.

CASE REPORT

In June, 1945, a patient was admitted to the Naval Hospital at which one of us (M.B.R.) was stationed. He was a twenty-two year old male, navy veteran with paralysis of both lower extremities, a decubitus ulcer over his sacrum and inability to sit normally or comfortably for any period of time in a wheelchair. While in boot-camp training he had sustained an acute onset of illness on February 14, 1943, with rapidly progressing paralysis of both lower extremities. A diagnosis of extradural inflammatory process was made and a laminectomy of the third, fourth, fifth and sixth dorsal vertebrae was performed in March, 1943, which verified the diagnosis. Convalescence

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FIG. 1. G. D. D., age twenty-two years; anteroposterior view. Massive bridges of coarsely trabeculated but otherwise normal appearing bone extend from the anterior portions of both ilia and the lower rims of both acetabuli to the anterior portions of the head, neck and upper fourths of both femora. The structure of the hip joints and femora are readily seen through the abnormal bone masses and present a normal appearance except for advanced atrophy. The hip joint spaces are not narrowed. On the left side some of the bone mass appears fractured medial to the femoral neck.

had included periods at two veteran's hospitals until July, 1944, at which time he was discharged to his home.

The paralysis of both lower extremities, present before the operation and persisting thereafter, showed little alteration as time went on. A finding of note in his physical examination was the presence of solid, hard masses over the anterior aspects of both hip joints. The right hip joint was solidly ankylosed in about 30 degrees of flexion while on the left there was an additional 10 degrees due to as much range of motion. The patient dated the onset of his acute illness as of February 14, 1943. From a transcript of his history the statement was noted that on March 10, 1943, he noticed a swelling for the first time developing over his right hip which became progressively larger. This would date the appearance of the ectopic bone deposits as less than four weeks after the acute onset of the illness. During the course of his convalescence he was fitted with double, upright braces. With these and the aid of crutches he was able to walk tripod fashion across the room and for a distance along the corridor. Fatigue of his upper extremities, of course, made this a self-limiting activity. He was able to move his bowels by means of abdominal pressure and to empty his bladder by means of manual compression.

Roentgenographic studies of his dorsal vertebrae disclosed the surgical absence of most of the laminae and spines of the third, fourth, fifth and sixth dorsal segments. There was no abnormal soft tissue calcification or ossification. The anteroposterior (stereoscopic), (Fig. 1) and lateral views of the lumbar spine and pelvis showed massive bridges of coarsely trabeculated but otherwise normal appearing bone extending from the anterior portions of both ilia and the lower rims of both acetabuli to the anterior portions of the heads, necks and upper fourths of both femora. The structure of the hip joints and femora could be readily seen through the abnormal bone masses and presented a normal appearance, except for advanced atrophy. The hip joint spaces were not narrowed. On the left side some of the bone mass appeared fractured in the region medial to the femoral neck.

The patient spent much of his time lying in bed between his ambulatory excursions rather than in a wheel-chair. This preference could not be discouraged nor, on the other hand, could he be prevailed upon to sit for any prolonged period in a wheel-chair. Because of the extension deformity of his hips such sitting was only possible by using the full flexibility of his lumbar spine. He sat on his sacrum rather than on his buttocks and hence the persistently recurring decubitus ulcer. If the complication of ectopic bone about the hips had not intervened, this patient would certainly have been an example of satisfactory rehabilitation.

As a result of such and similar observations, the authors thereafter and in private practise have been making special efforts to forestall the development of this complication in the management of paraplegics. It is their belief that the setting of the ossification pattern, if it develops, will do so in the early stages of recumbency; that is, in the immediate interval of bed rest following the onset of paraplegia and until such time as the patient is able to be sat up and later stood up for training in tripod walking. As was noted, this may be within the first four to six weeks of re-

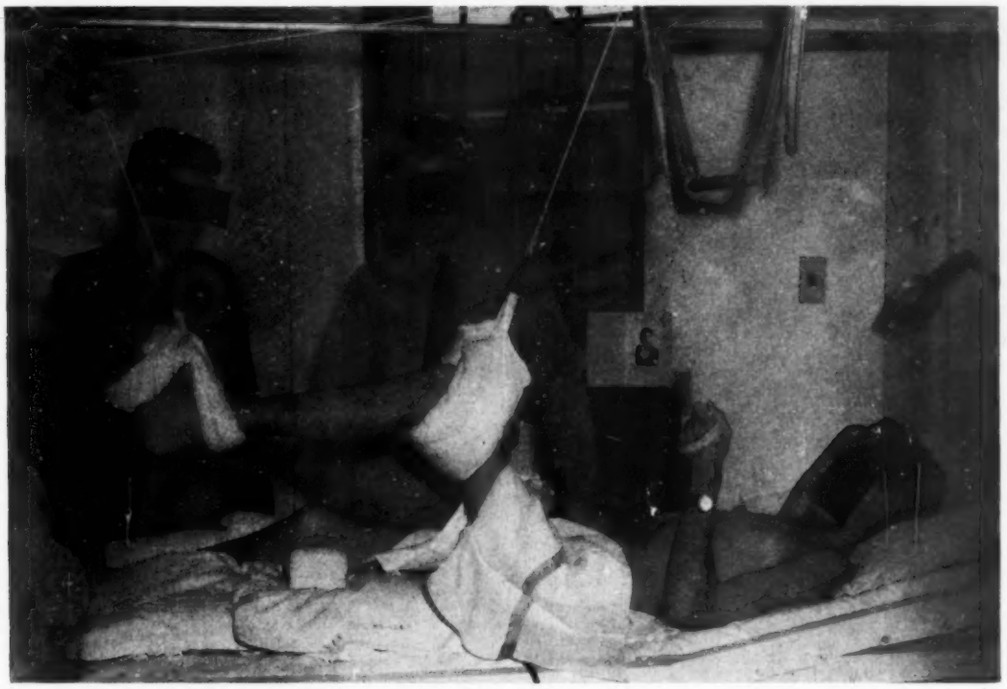

Fig. 2. Narrow slings of softly padded moleskin flannel are made to fit about the heels and around the knees of the patient. These are attached to cords suspended from pulleys and disposed in such a manner that the patient himself by exerting traction can lift each extremity until the ankle, knee and hip joints flex to a complete 90 degrees. Soft pillows are placed under the thighs and legs so overlapping as to allow 5 to 10 degrees of flexion of the knees and hip joints. Rolled pillows are placed between the feet and the foot of the bed to maintain the former at right angle position to the legs. The pillows beneath the legs are sufficient thickness to prevent the heels from lying directly upon the bed. To prevent continuous internal rotation and adduction contractures of the lower extremities, a small well padded block of proper dimensions is placed between the knees. The head of the fracture bed is raised slightly to relax the abdominal muscles.

cumbency. Mobilization as early as possible would seem to be the key-note.

During the initial period of recumbency, it has been the practice to begin physical conditioning of the patient from the very beginning. Much of this effort has been directed toward the development of the upper extremity, shoulder girdle and trunk muscles in anticipation of the eventual management of crutches in tripod ambulation. Because of the possibility of ectopic bone deposits ankylosing the hip joints and perhaps less frequently but just as definitely the knee joints, the powerless lower extremities should just as assiduously be carried through a complete range of motions in a passive manner. This is accomplished by a simple and time-honored device. Narrow slings of softly padded moleskin flannel are made to fit about the heels and around the knees of the patient. These are attached to cords suspended from pulleys and disposed in such manner that the patient himself by exerting traction can lift each extremity until the ankle, knee and hip joints flex to a complete 90 degrees. (Fig. 2.) This is his task in the program of his own rehabilitation; he believes he is helping to accomplish his own come-back; and because he enjoys doing it, it is good for his morale. Nor does he have to depend upon others to get this particular job done.

The patient is placed on a two-segment air mattress in a fracture bed. Soft pillows are placed under the thighs and legs so overlapping as to allow some 5 to 10 degrees of flexion of the knees and hip joints. Rolled pillows are placed between the feet and the foot of the bed to maintain the former at right angle position to the legs. The pillows beneath the legs are of suffi-

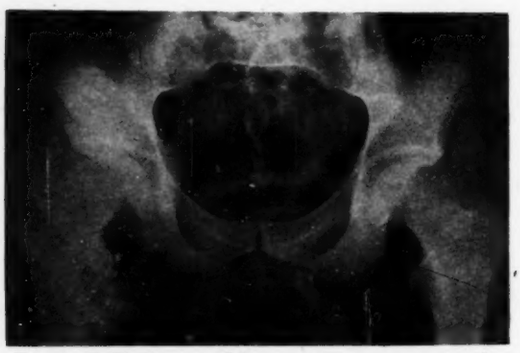

FIG. 3. J. E. S., age thirty years; anteroposterior view. There is a large amount of ectopic bone lying in the soft tissue anterior to the inferior portion of the ilium, the hip joint and along the medial aspect of the right femur, ending just below the lesser trochanter; traumatic transection of the cord sustained five months previously.

cient thickness to prevent the heels from lying directly upon the bed. To ward off continuous internal rotation and adduction contractures (both deformities being encouraged by the intermittent spastic seizures), a small well padded block of proper dimensions is placed between the knees. The head of the fracture bed is raised slightly to relax the abdominal muscles. For a period in the morning and again in the afternoon, the patient is transferred from the fracture bed and laid face downward upon a cart. The prone position on the cart with feet resting downward over the end, provides complete extension of the knee and hip joints, also an ample period of time for skin care. The cart can then be moved to the sun porch or such other place as will provide a change of scene.

As soon as is feasible, this routine of resting face downward on a cart is eliminated by getting the patient up in a wheelchair. He is then able to get about under his own power to visit about the ward and to go outside for varying periods when the weather allows. During the interval of recumbency, his lower extremities are measured for braces and, after a reasonable period in a wheel-chair, he is next fitted with his braces and, first in a walker and eventually with crutches, he is taught to ambulate tripod fashion. While no prolonged periods of walking are possible, the general stimulation of the upright position and weight-bearing both to his general health and to his morale is extremely worth while. It is yet another means of defeating the untoward influences of recumbency and, therefore, of the tendency for a continued decalcification of his bones.

General immobilization for a prolonged period depletes the calcium store of the whole skeleton, as has been observed in x-rays, and by the abnormally increased amounts of calcium in the blood stream and urine. The byproduct of this hypercalcemia and hypercalcinuria is the development of calculi in the renal pelvis and ureters. Whether there is a further reflection of this pathologic process in the formation of ectopic bone remains to be demonstrated. Some would add a neurogenic factor. But we have yet to encounter such a complication as ectopic bone about the hip joints in paraplegic cases resulting from anterior poliomyelitis. In the light of our present knowledge, it is therefore reasonable to attack the problem and forestall the appearance of this complication by eliminating the factors which tend to mobilize skeletal calcium, enforced recumbency and generalized immobilization.

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PRIMARY TORSION OF THE OMENTUM

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ONE of the conditions seldom considered in the differential diagnosis of the acute condition of the abdomen, and partly for that reason seldom diagnosed preoperatively, is primary torsion of the omentum. If the publication of individual case reports serves no other purpose, it at least acts as a reminder to the reader that, although not a common clinical phenomenon, primary omental torsion merits some consideration in surgical diagnosis, especially when the history and clinical picture do not point conclusively to any of the more common abdominal lesions.

Omental torsion may be roughly defined as a twisting or rotation of either the whole or a part of the omentum upon itself, resulting in the formation of a strictured neck distal to which the circulation is obstructed by the constriction. For practical purposes two types may be considered: an uncommon, primary, cryptogenic or idiopathic type in which there is no apparent cause for the torsion, and a second, more frequently encountered type resultant from or associated with a pathologic condition within the abdomen or in some external hernial sac. In 1928, McWhorter[1] compiled from the literature twenty-eight cases of the primary variety. This series was increased to thirty-nine in 1930 by D'Errico[2] and to fifty-four by Andrews[3] in 1938, to which Anton[4] has added three additional cases.

Various concepts have been advanced to explain the mechanism of primary torsion but only three merit consideration:

1. In view of the history of trauma noted in many patients some observers have contributed the view that importance be attached to external violence, severe exercise or strenuous body movements as the motivating forces initiating the rotation and twisting of the omentum.

2. Inasmuch as the omentum is constantly being rolled and twisted about as the result of intestinal peristalsis, especially when it is interposed between two coils of gut, gut and other abdominal viscera or the abdominal wall, it is highly conceivable that torsion might be induced by this factor. This is the most plausible of all three theories.

3. An ingenious but highly dubious hemodynamic theory was put forth by Payr[5] who maintained that inasmuch as the omental veins are larger, longer and more tortuous than the arteries and more easily compressed, any kinking of the omentum will result in some impediment to the venous circulation resulting in venous engorgement. This engorgement necessitates an increased pressure in the arteries which become tense, and the engorged veins in an effort to accommodate themselves wind around the artery, thus causing the whole omental mass to undergo twisting.

Whatever may be the mechanism involved in torsion, the omentum twists in a clock-wise direction, the number of twists being variable. The circulation is interfered with, edema and extravasation of blood occur into the mass and there is an effusion of serosanguineous fluid into the abdominal cavity. Grossly, the normally yellowish omentum becomes reddish with engorgement, purplish with extravasation and finally black with gangrene. The gangrenous omentum then sets up an inflammatory reaction in the surrounding tissues which develops into an aseptic peritonitis, or else organisms from the adjacent bowel may penetrate the necrotic

* Formerly Lieut. Colonel, Medical Corps.

mass to produce an abscess. Rarely, the mass may undergo atrophy and become partially or entirely absorbed, or it may become auto-amputated and attach itself to some neighboring structure.

The condition is rarely diagnosed preoperatively because it is seldom thought of in the differential diagnosis of the acute abdomen, and with the exception of the recognition of a mobile diffuse tumor mass early in the disease, there is nothing in the clinical picture which might distinguish it from the many other causes of the acute condition of the abdomen. Such signs and symptoms as nausea, vomiting, abdominal tenderness, fever, pulse acceleration and leukocytosis which do occur with primary torsion of the omentum are the early signs of any acute intra-abdominal lesion. For that reason most of the cases are diagnosed as appendicitis, gallbladder or gastroduodenal disease, or twisted ovarian cyst.

The treatment of the condition is simple. If on opening the abdomen one finds serosanguineous fluid, the search for omental torsion is mandatory.[3] Excision of the mass proximal to the point of rotation, with serial ligation of the omentum, is the indicated operative procedure.

CASE REPORT

K. R., a twenty-two year old soldier, was admitted to the Surgical Service of the hospital November 13, 1945 with a history of becoming ill on the afternoon of November 11th. This illness consisted of a sudden attack of what the patient called indigestion. There was no belching, no nausea and no vomiting, but only a feeling of epigastric distress and fullness. This feeling remained localized in the upper abdomen and the umbilical region. The pain remained all day as a dull ache in the epigastrium. He slept well that night but awoke the next morning with the same pain which lasted all day without remission and was not relieved by a Bromo-Seltzer. However, the pain was not intense enough to interfere with the patient's eating. His bowel habits remained normal. He slept well that night but on the morning of November 13th he awoke with more intense pain than on the previous two days. He reported to his unit dispensary from which he was sent to the hospital with a diagnosis of appendicitis. At no time had there been any nausea or vomiting. When the patient was examined on admission, his temperature was 100.6°F., pulse 124 and respirations 24. His white blood cell count was 10,000; polymorphonuclears, 70 per cent; lymphocytes, 28 per cent and eosinophiles, 2 per cent. There was some generalized abdominal tenderness, no masses and no spasm. Tenderness was most marked in the right lower quadrant. The ward surgeon did not think the patient's condition at this time warranted surgical intervention. The next morning his temperature was 99.8°F., pulse 82 and respirations 20. The white blood cell count was 7,600; polymorphonuclears, 67 per cent; lymphocytes, 31 per cent and basophiles, 2 per cent. Examination at this time showed increased tenderness in the right lower quadrant with some muscle spasm together with generalized abdominal tenderness. No masses were palpable and rectal examination was negative. Operation was decided upon, the tentative diagnosis being acute appendicitis. The abdomen was opened through a McBurney incision. On opening the peritoneum there was an escape of serosanguineous fluid. There were coils of redundant sigmoid in the right iliac fossa and the appendix when brought into view was normal. The incision was enlarged to permit the entrance of a hand for exploration of the abdomen. The rectum, sigmoid, descending colon, splenic flexure and transverse colon were normal to palpation. In the right upper quadrant a firm mass about the size and shape of a baseball was palpated. This mass was easily brought down into the wound and found to be a purplish, globular mass 8 cm. in diameter, the result of a 360 degree clock-wise rotation of the distal portion of the omentum. The mass was excised by serial ligation of the omentum proximal to the point of constriction. Appendectomy was done and the abdomen closed without drainage. The patient made an uneventful recovery.

Comment. The absence of nausea or vomiting should have made one suspicious of the diagnosis of acute appendicitis.

SUMMARY

1. A case of primary torsion of the omentum is presented.

2. The condition is briefly discussed as to frequency, mechanism, diagnosis and treatment.

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THE "overprolonged" use of the Miller-Abbott tube in intestinal obstruction may cause intestinal perforation, fatal or otherwise. Berger and Achs report a recent patient that recovered but surgeons and especially the hospital interns and residents, must surely realize that passage of this hard rubber tube may be dangerous, especially if the vitality of the bowel is questionable. They must, therefore, be careful in its use. Properly used, in the vast majority of cases, it is often a life-saving procedure. It is well, however, to keep its occasional dangers in mind. (RICHARD A. LEONARDO, M.D.)

HIGH INTESTINAL FISTULA AND ITS TREATMENT BY THE USE OF A PAULS TUBE*

EDWARD G. JOSEPH, M.S., M.B., M.R.C.S.
Jerusalem, Palestine

INTESTINAL fistula is an irritating and troublesome complication of many surgical procedures; it is usually dangerous to life only when it occurs in the proximal part of the small bowel. Fistulas of the jejunum and duodenum are so very disabling that in a short space of time the patient is reduced by loss of fluids, electrolytes, chlorides and nourishment to a state of complete collapse. There ensues a rise in blood nitrogen and a corresponding fall in blood sodium and chloride ions. Such patients are quite unable to stand any operative interference due to the extreme state of emaciation and debility; their general condition is aggravated by a severe excoriating erosion of the surrounding skin. Urgent treatment is imperative. The patient must receive a definite amount of nourishment, otherwise starvation and dehydration follow very rapidly and death ensues. The problem is extremely acute and will tax the ingenuity of the surgeon to the highest degree.

Some means must be found whereby the fistula may be closed, but in such a way that the lumen of the bowel remains unimpeded. Reybard used a wooden button in the lumen of the gut tied to a crossbar on the abdominal wall by a suture passing through the fistula. A button of leather was recommended by Kleybolte. Dowd described a double metallic button which has also been successfully used by Mayo-Kappis in 1911. A T tube was used with the straight part of the tube providing a channel between the upper and lower parts of the bowel with the right-angled part protruding through the fistula blocking it and providing drainage for overflow.

These methods are all good in certain limited cases. It often happens, however, that the fistula is situated in a part of the bowel that makes an acute angulation; therefore, no button is able to maintain its position and will be displaced almost at once. The disadvantage of the T tube is that there is a constant flow of intestinal contents around it. This produces a fatal outcome, especially if the fistula is a large one. We are thus driven to the conclusion that these methods have a very limited field and are useful in those types of fistula only in which the opening occurs as a defect in a horizontal segment of bowel.

There may be, however, a complete severance of continuity of the small bowel or the opening may be a very large one. In these cases inadequate treatment is rapidly fatal because the patient is deprived of all nourishment. To meet such an emergency as the above, Macnaughton has devised an apparatus which was successfully used by him and appears to me to be an excellent device. Rubber catheters are inserted, one into the afferent and the other into efferent segments of the bowel. The intestinal contents by means of continuous suction are aspirated into a container from which they are allowed by force of gravity to flow into the efferent catheter and so into the distal bowel. This device requires a certain amount of ingenuity to construct, but undoubtedly appears to be the best method as yet described for overcoming this very acute surgical complication.

Recently a patient developed a very high jejunal fistula, a fistula that was so large that no intestinal content could pass beyond the opening in the bowel and a state of extreme urgency rapidly developed; the

* From Hadassah University Hospital, Jerusalem, Palestine.

patient became almost pulseless and it was obvious that any further delay would be fatal. Rubber buttons and tubes were inserted; but because of the angulation of the bowel and because of the great size of the fistula, they came out at once. It occurred to me that a Pauls tube might temporarily close the opening and at the same time divert the jejunal contents into the distal bowel; further than that Pauls tubes are obtainable in three sizes and so one of these tubes would most likely fit the bowel snugly. In addition, since they are constructed in the form of a right angle, they would be eminently suitable inasmuch as the point of opening of the fistula coincided with the apex of the angulated bowel. The smallest of the Pauls tubes was found to be of the correct size, so a stout piece of silk was tied around the middle of the tube and left long; the Pauls tube was fairly easily manipulated into the bowel through the fistulous opening and maintained in position by anchoring to a wooden tongue depressor on the abdominal wall. The bowel leakage was reduced to a minimum and the fluid contents of the jejunum could be seen passing along the Pauls tube into the distal segment of the bowel. (Fig. 1.)

The patient at once reacted in a most remarkable manner; whereas before he had appeared to be almost moribund and in a semicomatose state, he became a different being altogether within a few hours. His pulse became strong and slow and he was able and willing to drink freely; his bed which had been constantly soaked with intestinal fluids remained dry and only the dressings became somewhat soiled. Some 90 per cent of the jejunal contents were able to pass into the distal bowel. Every few days the Pauls tube would become clogged with solid matter, and it was found to be an easy procedure to remove and clean the glass tube and to reinsert it. In the course of a few weeks, the patient regained his health and strength to such an extent that to all outward appearances he was a perfectly normal man.

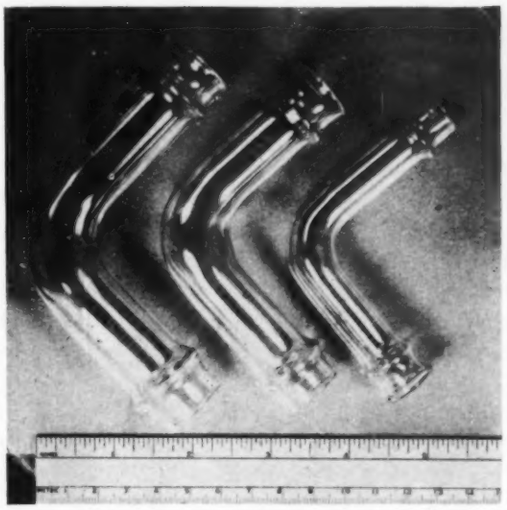

FIG. 1. Illustration showing the three sizes of the Pauls tube.

At this stage an operation was performed with the Pauls tube still in place; the two ends of the bowel were freed up and mobilized, the peritoneal cavity was opened and an end-to-end anastomosis carried out.

CASE REPORT

A man, sixty-five years of age, was admitted to the hospital complaining of nausea, heartburn, and a feeling of weight in the epigastrium of six months' duration. His condition steadily deteriorated and was accentuated by loss of appetite and loss of weight. He had suffered for many years with a severe form of asthma. His family history indicated that the father had been a victim of asthma. X-rays showed a carcinoma near the pyloric end of the stomach; the tumor was of moderate size.

Physical examination showed an elderly man somewhat debilitated, breathing asthmatically. The color of the skin and of the mucous membrane was normal. The tongue was moistened but not coated. Bronchial râles on both sides were heard. The abdomen was soft with tenderness in the epigastrium. The liver and spleen were not enlarged. There was no edema of the extremities. Urine examination was negative. Examination of blood was as follows: Blood urea 28 mg. per cent; sugar 101 mg. per cent; Kahn test negative; total protein 6.95, albumin 4.03, globulin 2.92. On March 3, 1946, subtotal gastrectomy was carried out under continuous spinal anesthesia; following the operation he coughed a great deal and contracted a severe bronchitis. On March 11th, the stitches were

removed, and some hours later he coughed violently and an evisceration occurred.

Operation was at once performed and the abdomen was closed with through-and-through stitches of heavy silk; a large penrose drain was placed between the silk stitches and the bowel in order to prevent pressure of the silk producing a fistula. On March 21st, a fistula developed with the outpouring of a vast quantity of jejunal content. Some days later the surrounding skin became macerated so a catheter was inserted and continuous suction instituted.

The patient's health and strength rapidly declined. He lost weight, became emaciated and dehydrated in spite of continuous intravenous saline and glucose infusions and many blood transfusions.

On April 7th, operation was performed. The fistula was closed and covered with omentum. The closure was only temporary and his general condition still further deteriorated. The patient became almost moribund.

On April 21st, a Pauls tube was inserted thereby connecting the afferent and efferent ends of the jejunum. It was kept in position by a silk thread attached to a wooden applicator. The jejunal contents at once began to pass along the Pauls tube and, as a result, the general condition of the patient began to improve although the artificial junction gave rise to some leakage; yet, he rapidly picked up strength to such a degree that on May 14th an entero-entero anastomosis was performed, and the patient left the hospital on May 29, 1946, in excellent condition.

CONCLUSION

Fistulas of high intestinal origin are a source of great danger. Immediate radical treatment cannot be carried out because of the condition of extreme emaciation that almost immediately ensues. A method is described wherein the patient obtains sufficient nourishment that will permit him to gather strength to undergo a major operative procedure.

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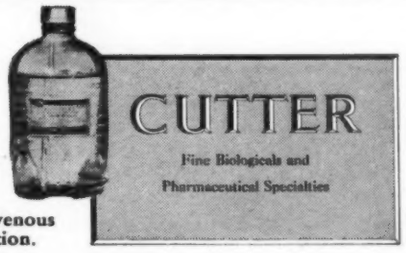

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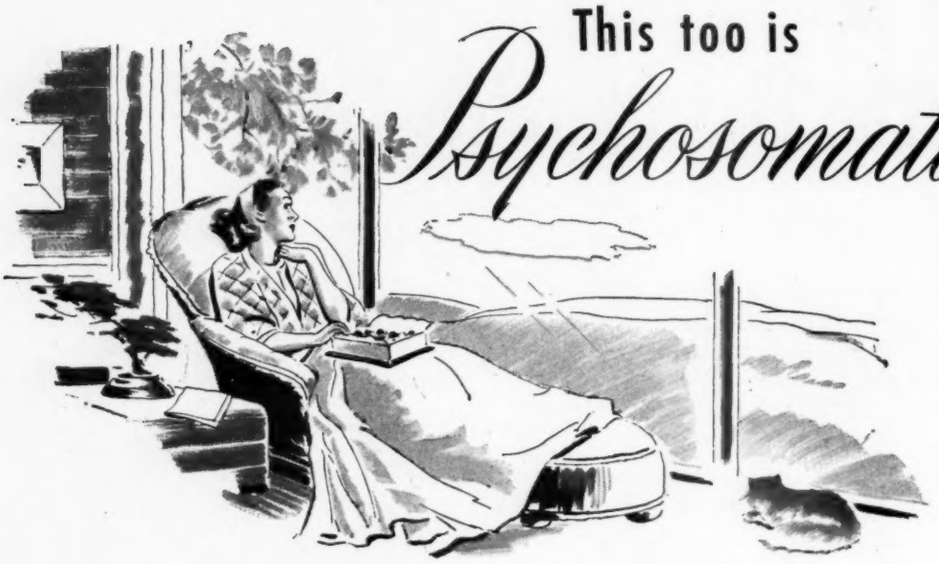

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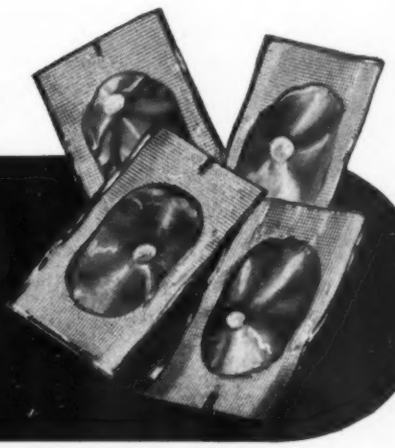

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>
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2. Brainerd, Henry, Jour. Ped. Jan., 1948

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[1] Combes, F. C. et al.: Am. J. Surg., 74:45, 1947

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(*continued from page 20*)

profession are the following officers of the American Medical Association: Dr. R. L. Sensenich, President-Elect; Dr. E. L. Henderson, Chairman of the Board of Trustees; Dr. Ernest E. Irons, Secretary of the Board of Trustees; Dr. Morris Fishbein, Editor of the Journal; and Dr. Austin Smith, Secretary of the Council on Pharmacy and Chemistry. Dr. Sensenich is chairman of the committee.

This foundation is an historic development, because it is the first joint action by the pharmaceutical industry and medical profession in such an organization for basic medical research. Therefore, it will be named *The Pharmaceutical-Medical Research Foundation*, and it will be financially supported, in major part, by the pharmaceutical industry as a contribution to the national welfare.

A grateful Bay State father, whose epileptic son regained his health through the use of newly developed drugs, has contributed $5,000 for further research in the disease at the College of Physicians and Surgeons of Columbia University.

Requesting that his name be withheld, the donor stated he was advancing the money with the hope that current **research on epilepsy in progress at Columbia** "may have outstanding results."

The son figured in the initial studies that led to the development of a standard treatment of epilepsy. With the financial help of his father and his own perseverance, the son was able to serve for a limited time in the Air Forces during the war and later attended an eastern university. Now ready for graduation, he is "an excellent example of what an adequately treated idiopathic epileptic individual can do."

The son was initially treated with dilantin sodium, but the toxic effects outweighed the therapeutic value. He was always tired, sleepy and at times unsteady on his feet. Then he was changed to a new drug known as "mesantoin," and it was found that the curative results were relatively greater than the toxic effects. Mesantoin, Dr. Price explained, is a sister medicine of dilantin. It is superior, he added, to dilantin in some cases and yet it has less effect on the seizures in other patients. He said its most valuable asset is "that it prevents or cures hypertrophic gingivitis caused by dilantin."

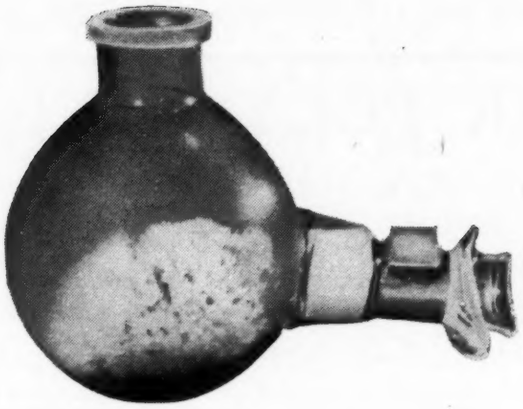
The money contributed by the father to the University will be used to continue research in the Neurological Institute and the Baird Foundation Clinic. It is essentially a study of new medicines that tend to control seizures, integrated into a program that enhances socio-economic reclamation of the epileptic person.

Just off the press is the book **Music and Medicine,** edited by Dr. Dorothy M. Schullian, Curator of Rare Books at the History of Medicine Division, with the cooperation of Dr. Max Schoen, Professor and Head of the Department of Education and Psychology at the Carnegie Institute of Technology. The book, published by Henry Schuman, Inc., January, 1948, is composed of sixteen essays written by various authorities in the field, and traces the history of musical therapy from primitive times down to the modern era. Some of the essays also discuss the ever increasing use of music in industry and its effect in creating happier working conditions. Of especial interest to the Army Medical Library is the essay "Men Who Have Loved Music," by Fielding H. Garrison, who was associated with the Library for nearly forty years. Included in the book is a sixty-four-page bibliography of special references in the field of music and medicine.

Importance of folic acid, member of the vitamin M group, as a weapon for attacking the frequently fatal "hot country" **disease of sprue** has been demonstrated by clinical studies completed at the Vanderbilt University School of Medicine and the Tennessee Department of Public Health, Nashville, supported in part by a grant from the National Vitamin Foundation.

Dr. Ilza Veith has been appointed consultant to the Army Medical Library to work in the field of **oriental medicine.** Dr. Veith received her Ph. D. in the History of Medicine from Johns Hopkins University. She has published a number of articles dealing with historical and medico-historical problems of the Far East.

Her work at the Library will include surveying the present holdings in oriental medicine and making recommendations for purchase, and assisting in reference problems and in cataloging the backlog collection.



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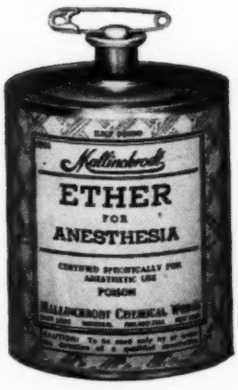

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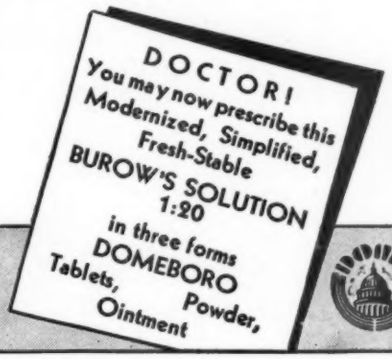

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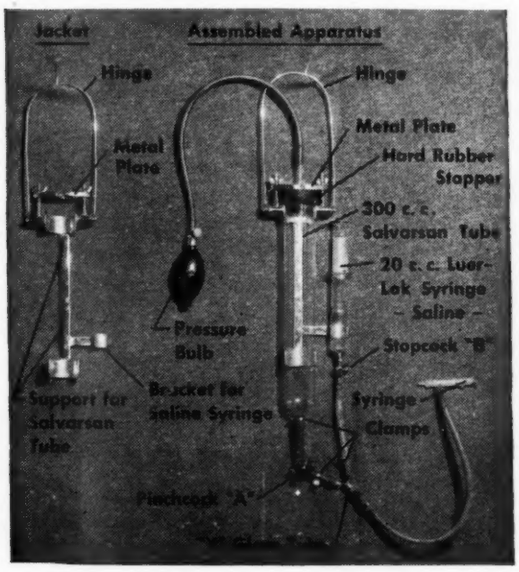

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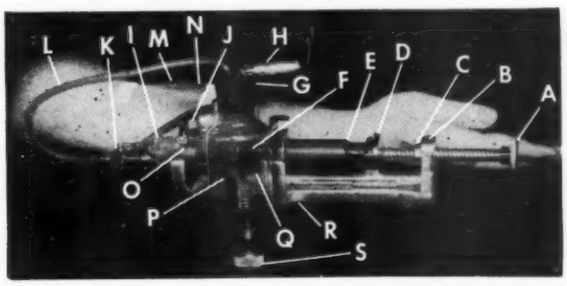

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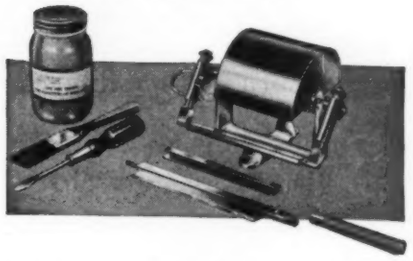

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LANGLEY, W. D. and MORGAN, W. S.	Chlorophyll in the Treatment of Dermatoses.	Penn. Med. Journal Vol. 51; No. 1 (1947)
MORGAN, W. S.	Chlorophyll Therapy A Review of 114 cases.	Guthrie Clinic Bulletin, 16: 94 (1947)
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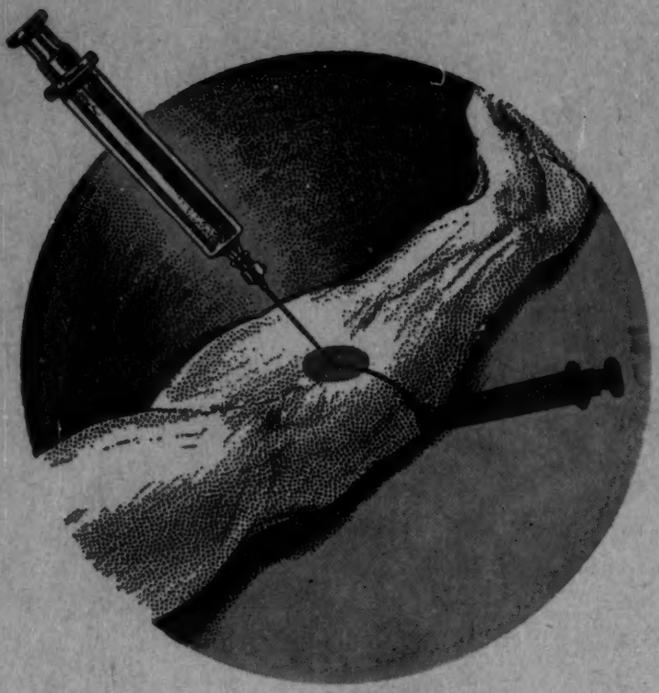

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1. Arbesman, C.E., et al., Jl. of Allergy 17:275, Sept. 1946
2. Feinberg, S.M., and Friedlaender, S., Am. Jl. Med. Sci. 213:58, Jan. 1947.
3. Fuchs, A.M., et al., Jl. of Allergy 18:385, Nov. 1947.

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